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SILBERSCHMIDT (K.) & LOPEZ TORRES (H.). **Algumas observações sôbre o mecanismo da acumulação do 'Nicotiana virus 1 (Mayer) Allard' em folhas de Fumo.** [Some observations on the mechanism of the accumulation of '*Nicotiana* virus 1 (Mayer) Allard' in Tobacco leaves.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 97–140, 2 pls., 5 graphs, 1944. [English summary.]

Experiments to determine the possible influence of the concentration of the inoculum on the mode of increase of the tobacco mosaic virus in tobacco foliage and on the virulence of the resultant symptoms were performed, mostly by Rischkov's detached-leaf method [*R.A.M.*, xxiii, p. 81], mainly on the susceptible White Burley and resistant Palmira 12 varieties. In these tests the petiole was immersed in a small Petri dish containing water or a nutrient solution, while the leaf tip was supported by a cardboard holder. The opposite halves of the leaf blades were rubbed with infective juice, one half (A) at a dilution of 1 in 10 of the crude sap, and the other (B) at 1 in 10,000. The virulence of the saps (a) and (b) obtained from the halves (A) and (B) of successive leaf samples was tested by inoculations on *Nicotiana glutinosa*, using Youden and Beale's local-lesion method of estimation [ibid., xiv, p. 197].

Virus activity was found to increase, not continuously, but through a series of fluctuations, from the second day onwards, reaching a maximum about the 20th day after inoculation. The differences in virus activity between the (a) and (b) saps were particularly noticeable during the first fortnight after inoculation, but tended to diminish thenceforward, though even by the close of the experimental period they had not altogether disappeared, at any rate in the susceptible Havana and White Burley varieties. Neither the kind of nutrients supplied nor the variations in temperature occurring during the trials appeared to influence virus accumulation in the leaves. Corresponding to the increase of virus activity in plants inoculated with the higher concentration was an access of severity in the symptoms, which appears to substantiate the view expressed, e.g., by Kausche [ibid., xvi, p. 829], that the concentration of the infective principle bears a closer relation to its pathogenicity than has generally been admitted. The authors' observations point to caution in the acceptance of the theory of autocatalytic virus multiplication within the host irrespective of the amount of inoculum introduced.

ALCARAZ MIRA (E.). **Obtención de razas de Tabaco resistentes al mosaico ordinario.** [Development of Tobacco races resistant to ordinary mosaic.]—*Bol. Inst. Invest. agron., Madr., 1944*, 11, pp. 89–120, 18 figs, 1944. [French, English, and German summaries.]

Since 1933 hybridization experiments have been in progress at the Station of Tobacco Studies, Santiponce, Seville, with a view to the development of mosaic-resistant tobacco selections from crosses between the varieties cultivated in Spain, namely, Valencia, Kentucky, Filipino, Maryland, and Habano, and Nolla's highly resistant Ambalema [*R.A.M.*, xiv, p. 660]. The mode of procedure involved the production of several generations without selection, inoculation tests, separation

of the seed of resistant plants, and hothouse propagation of auxiliary generations to confirm the stability of immunity in the progeny of uninfected plants before pursuing the selection. Of the original three hybrids obtained, i.e., 60 (Ambalema × Filipino), 61 (Ambalema × Kentucky), and 57 (Ambalema × Valencia), the first-named was the most satisfactory both as regards resistance and leaf quality. Two recent selections, 230 (Hybrid 60 × Filipino) and 224 (Hybrid 60 × Hybrid 217) are superior to the foregoing in respect of foliar characters, but less resistant to mosaic.

Williams (R. C.) & Wyckoff (R. W. G.). **Electron shadow micrography of the Tobacco mosaic virus protein.**—*Science*, N.S., ci, 2632, pp. 594–596, 3 figs., 1945.

The authors describe a method of electron micrography in which a thin film of gold is shadow-deposited on dried films of tobacco mosaic virus protein, the gold deposit being stripped off with the aid of collodion and photographed with the usual equipment of the electron microscope. The results show that the segmented rods or fibrils are about 125 Å in both height and width, the length of the segment being variable. The method can be used for viruses of much smaller particle size.

Alexander (L. J.) & Tucker (C. M.). **Physiological specialization in the Tomato wilt fungus Fusarium oxysporum f. lycopersici.**—*J. agric. Res.*, lxx, 9, pp. 303–313, 1 fig., 1945.

The authors describe experiments on testing resistance to tomato wilt (*Fusarium oxysporum* f. *lycopersici*) in Ohio, where a distinctive race of the pathogen has been isolated. Comparative studies of this race with isolates from Missouri [*R.A.M.*, xix, p. 501] and Washington were made with various tomato varieties, *Lycopersicon pimpinellifolium* (accession No. 160), and a number of *L. pimpinellifolium* × *L. esculentum* crosses and their progenies. In these trials, [the results of which are tabulated], all the commercial varieties of tomato tested (including varieties resistant to other races of the pathogen) proved susceptible to the Ohio race, but *L. pimpinellifolium* (No. 160) appeared to be segregating for resistance and susceptibility to this race. The Missouri and Washington isolates exhibited the same type of pathogenicity, although the latter consistently caused a few more plants to become diseased, and resistance to these races appeared to segregate according to a simple Mendelian ratio. The inheritance of resistance to the Ohio race is more complicated and appears to involve the gene for resistance to the Missouri race and an undetermined number of complementary genes.

Green (D. E.) & Thomas (C. T.). **Note on blight of outdoor Tomatoes.**—*J. R. hort. Soc.*, lxx, 7, pp. 211–214, 1945.

In a small test at Neath, South Wales, in 1944 on the control of blight (*Phytophthora infestans*) on outdoor tomatoes [*R.A.M.*, xxiii, pp. 47, 462], Market Ring tomatoes interplanted with potatoes were sprayed with Bordeaux mixture (made from a proprietary paste) or a colloidal copper spray (the potatoes remaining untreated), each with added saponin, on various dates from 15th July to 27th August, plots 1 to 4 receiving one application, plots 5 to 7 two, plots 8 and 9 three, and plot 10 four. One plot remained unsprayed. In the Bordeaux plots the percentages of infection were, respectively, 18·1, 19·6, 17·5, 21·6, 35·6, 5·5, 10·9, 7·9, 6·9, 6·5, and (control) 61·5, while in the colloidal copper plots they were 30·3, 17·5, 8, 10·4, 9·6, 1·8, 2·3, 1·7, 1·1, 1·2, and (control) 36·8. These results show that in western England two sprayings are necessary as compared with only one in south-eastern districts, the most effective appearing to be those of 30th July and 12th August, possibly because infection developed rather late.

Rhoads (A. S.). **Some observations on diseases of woody plants in Florida.**—*Plant Dis. Reptr*, xxviii, 7, pp. 260–272, 1944. [Mimeographed.]

Root rot, caused by *Clitocybe tabescens* [*R.A.M.*, xxi, p. 497], was observed on a large tree of *Pinus glabra* in Alachua County, this being a new host record for that fungus.

Records of wood-rotting fungi on living trees in Florida include *Fomes geotropus* [ibid., xviii, p. 772], fruit bodies of which were found growing in the centres of open, circular, gnarly, gum-exuding lesions, about 9 ft. above the base of a *Magnolia grandiflora* tree, and also on a basal scar of a box elder (*Acer negundo*); *F. marmoratus*, fruiting on an old fire scar at the base of a laurel oak (*Quercus laurifolia*), and also on an apparently uninjured large pignut hickory (*Carya glabra* var. *megacarpa*); *Ganoderma curtisii* [? *G. lucidum*: ibid., x, p. 138] on *Persea humilis*; *G. sulcatum* on *Sabal palmetto*; *Polyporus fissilis* [ibid., xv, p. 470] on southern red oak (*Quercus rubra*); *P. gilvus* [ibid., vii, p. 753] on *Q. laevis*; and *P. sector*, *P. hispidus* [ibid., xviii, p. 83], and *P. sulphureus* on *Q. laurifolia*.

The galls of the southern fusiform rust (*Cronartium fusiforme*) [ibid., xx, p. 187] were found to be widespread in many counties of northern Florida, especially on *Pinus echinata* and frequently on *P. taeda*, but also occasionally on *P. caribaea*. The infection of young trees is often very severe, leading to deformation, and rendering them useless for timber production.

Leaf blight of mistletoe (*Phoradendron flavescens*), caused by *Sphaeropsis visci*, is stated to be of frequent and widespread occurrence in many parts of Florida, attacking stems as well as leaves, the fungus fruiting abundantly on the latter.

A number of fungi (chiefly *Septobasidium* spp.) are also recorded as parasitic on scale insects in the forests of north-central Florida.

Tyler (L. J.). **Influence of temperature on the Dutch Elm disease in potted American Elm.**—*Phytopathology*, xxxv, 5, pp. 302–304, 1945.

In the summers of 1940, 1941, and 1942, some 200 potted American elms, ranging in height from 2½ to 7 ft. and in age from three to four years, were inoculated with conidial suspensions of a virulent isolate of *Ceratostomella ulmi* 12 to 24 hours after, or in one case just before, their distribution in six temperature chambers, one group being set aside for outdoor growth. The temperature and relative humidity ranges in the six chambers and out-of-doors were (1) 9·5° to 12° C., 75 to 85 per cent.; (2) 15° to 16°, 80 to 94; (3) 18·5° to 21°, 76 to 85; (4) 12·5° to 20°, 62 to 100 (outside); (5) 21·5° to 25°, 61 to 78 (basement corridor); (6) 26° to 29°, 69 to 84; and (7) 32° to 37°, 66 to 79. The exposure periods varied between a week and a month.

The temperature range generally conducive to Dutch elm disease extended roughly from 15° to 29° [*R.A.M.*, xiii, p. 733]. Trees exposed to temperatures fluctuating between 26° and 29° developed 100 per cent. wilt in three to five days, and the amount of wood discoloration showed invasion by the pathogen to be quasi-complete. On the other hand, at 32° to 37° or at 9·5° to 12°, there was at least a fortnight's retardation or even inhibition of infection, while penetration was almost entirely suppressed. The transference of trees, after four days at 27°, to a chamber held at 10° resulted in two to five days' delay in the appearance of symptoms. Conversely, removal to a temperature of 27° after four days at ranges adverse to the pathogen expedited symptom expression by two to four days. When trees in an active state of terminal growth were transferred to the open after one to three weeks' exposure to temperatures unfavourable to the disease, e.g., 10° and 32° to 37°, they ultimately developed complete wilting and extensive fungal invasion. If, on the other hand, terminal growth had ceased before exposure to unfavourable temperatures, the wilt was definitely suppressed in some trees and failed to develop in others even on removal to the open. Fifteen hours' nocturnal

exposure (5 p.m. to 8 a.m.) at 32° to 37°, alternated with a daily nine-hour, outdoor daytime (8 a.m. to 5 p.m.) period at a range of 10° to 33° altogether inhibited the wilt, whereas the reverse treatment, i.e., indoors at high temperatures during the day and outdoors at lower ones at night, permitted complete wilting in 14 to 26 days. Inoculated controls kept constantly out-of-doors for the same period wilted entirely within a fortnight, while those maintained at 32° to 37° did not contract the disease but sustained severe foliar injury. Evidently, therefore, the pathogenicity of *C. ulmi* to potted elms may be modified to a considerable extent by temperature fluctuations.

Tehon (L. R.). **American Elms die by tens of thousands from phloem necrosis disease epidemic.**—*Greenk. Reptr*, xiii, 2, pp. 17–19, 3 figs., 1945.

During the summer of 1944, phloem necrosis destroyed tens of thousands of elms [*R.A.M.*, xxiv, p. 256] in West Virginia, Ohio, Indiana, Illinois, Missouri, Kansas, and as far south as Mississippi, and at present it is more to be feared in the Midwest than Dutch elm disease [*Ceratostomella ulmi*]. The total number of trees dying during the epidemic is not known, but it has been estimated that 10,000 were lost at Columbus, Ohio, and over 1,600 in the southern half of Illinois. Though first reported with certainty from Ohio in 1918, phloem necrosis may well have been responsible for a number of severe outbreaks of elm disease in Kentucky and Illinois between 1882 and 1918. Infected trees cannot be saved by any known treatment, but attempts are in progress to develop resistant varieties from the survivors of an epidemic that ravaged northern Kentucky during the 'nineties of last century.

Kuhnholtz-Lordat (G.). **Le dépérissement des châtaigneraies cévenoles.** [Wilt of Chestnut groves in the Cevennes.]—*Ann. Éc. Agric. Montpellier*, N.S., xxvi, 3, pp. 32–34, 1944.

After referring to the great variability shown by the symptoms of chestnut ink disease, the author states that his observations on chestnut wilt in the Cevennes in 1942 convinced him that the reason for this variability is that chestnut roots may be destroyed by several factors, acting together or independently. The problem of chestnut wilt is not a simple one, due to ink disease alone, but a complex one made up of a number of factors. In his opinion, the wilt in the Cevennes may be due to *Armillaria mellea* [*R.A.M.*, iii, p. 8], causing root rot, *Phytophthora cambivora* [ibid., xxiii, pp. 156, 375], causing ink disease, root infestation by an unidentified insect causing 'fioc' or fire, and, possibly, various non-parasitic factors.

Long (W. H.). **Notes on four eastern species of Gymnosporangium.**—*J. Wash. Acad. Sci.*, xxxv, 6, pp. 182–188, 2 figs., 1945.

This paper reports investigations conducted in 1912 and 1913 in the District of Columbia and vicinity on the occurrence on red cedar (*Juniperus virginiana*) of four species of *Gymnosporangium*, *G. clavipes*, *G. nidus-avis*, *G. effusum*, and *G. juniperi-virginianae*, to ascertain their prevalence and distribution, their action on the host and, if possible, the aecidial stage of *G. effusum*.

G. clavipes and *G. nidus-avis* were found widely distributed in the areas surveyed and *G. effusum* and *G. juniperi-virginianae* less so. *G. clavipes* was rarely abundant on trees with open tops or with lower limbs removed for half the distance up the tree, and it was not prevalent on solitary trees in the open with small branches down to the ground. Trees without trunk lesions of *G. clavipes* were seen to be comparatively unshaded and to have open foliage. This rust travelled more rapidly

laterally than longitudinally and did not kill the living bark even in the centre of the oldest and largest lesions on trunks and large branches, but killed small branches and twigs by girdling. All lesions found were on well-developed wood without needles. *G. clavipes*, a serious rust on certain varieties of apples, would prove a menace to apple culture during favourable years in this area.

The heavy infection by *G. nidus-avis* of cedars in the Arlington Cemetery and Great Falls, Virginia, districts was probably due to their considerable size and great age, and three types of lesions were produced, namely, trunk, branch, and broom. On cedars examined from the Washington area, teleutosori or lesions were confined to the limbs and branches with heartwood. The living bark down to the sapwood under and adjacent to the teleutosori was stained a golden-yellow during the maturation and gelatinization period. This was a very marked characteristic by means of which the infected area could often be determined even before the teleutosori were formed. This yellow colour was due to small, yellowish globules in the hyphae of the subhymenial layers. Many suppressed, but apparently mature, golden-yellow spores were present, but these were not the main cause of the yellow colour.

Lesions of *G. effusum* formed deep-seated, woody-corky, truncate, ridge-like galls, 2 to 6 mm. high and 3 to 12 mm. wide, running longitudinally in parallel rows on branches and trunks of the red cedar. When alive, they were composed of rather firm, cheese-like tissue filled with rich foodstuffs for the development of the teleutosori. After the teleutospores matured, the galls became brown, more or less suberized, and covered with a corky callus. After one, or possibly two, years of fruiting these galls died, but persisted for years on the old dead areas of the lesions.

The infection spread slowly transversely on branches and trunks and the new galls developed at irregular intervals next to and on the outside of the old ones and parallel to them. When expanded the teleutosori were wedge-shaped, 10 to 12 mm. high by 2 to 6 mm. thick at the top and 10 to 30 mm. long, and often fell away in a body, leaving a yellowish scar. Successive years of fruiting on twigs and branches finally killed the lesions by the complete destruction of the cortex, phloem, and cambium, the only *Gymnosporangium* known to do so. Very old lesions had a charred look like a fire scar.

G. juniperi-virginianae was only present to any appreciable extent in areas with young and small cedars.

The author considers that the aecidial host of *G. effusum* is probably one or more of the species of *Crataegus* listed for *G. hyalinum*.

VERRALL (A. F.). **The control of fungi in lumber during air-seasoning.**—*Bot. Rev.*, xi, 7, pp. 398–415, 1945.

A comprehensive and informative survey is made of the various accepted treatments for controlling fungi in timber, accompanied by a bibliography of 91 titles. As much as $3\frac{1}{2}$ billion board feet of lumber annually are estimated to be dipped in chemicals for the prevention of fungus deterioration in seasoning yards [in the United States].

CHESTER (K. S.) & MCLAUGHLIN (J. H.). **Recognition and control of vegetable diseases.**—*Circ. Okla. agric. Exp. Sta. C* 117, 16 pp., 1 fig., 1945.

This circular gives directions in popular terms for the recognition of the common vegetable diseases in Oklahoma, shows how the losses they cause can be reduced, and indicates the principal disease-resistant vegetable varieties and the best seed treatment. A table is appended giving the methods of control of the various diseases.

Stapel (C.). **Mosaiksyge paa Kaalroer, en ondartet, men upaaagtet Sygdom.** [Turnip mosaic disease, a virulent but unheeded disease.]—Reprinted from *Ugeskr. Landm.*, *1940*, 4 pp., 6 figs., 1940. [Received August, 1945.]

The turnip mosaic virus was responsible for heavy losses in several parts of Denmark in the autumn of 1939. Much of the damage formerly attributed to *Contarinia nasturtii* and *Brevicoryne brassicae* is believed to have been actually due to the mosaic virus, the symptoms caused by which are very similar in some respects to those due to the insect pests.

LeBeau (F. J.) & Walker (J. C.). **Turnip mosaic viruses.**—*J. agric. Res.*, lxx, 11, pp. 347–364, 8 figs., 1944.

In this study, four virus isolates from turnip were compared with one another and with previously described viruses from cruciferous plants [see next abstract].

One of the isolates (T8) corresponds closely in properties and host range with the strain of turnip virus 1 [turnip mosaic virus] described in a forthcoming publication in *J. agric. Res.* as cabbage virus A [loc. cit.], and with the black ring [*R.A.M.*, xvii, p. 151] and ring necrosis [ibid., xx, p. 507] viruses from cabbage; these viruses differ chiefly in their effects upon the host plants. The other three isolates, T1, T6, and T9 are similar to T8 in properties and breadth of host range, but differ from each other and from T8 in rather important host selectivity and in symptomatology on certain common hosts. None of the last three infects cabbage, cauliflower, kale, Brussels sprouts, or annual stock [*Matthiola incana* var. *annua*], though all infect green sprouting broccoli and only T9 infects kohlrabi and dame's violet [*Hesperis matronalis*].

T8 and T9 infect all the species of *Nicotiana* tested and T6 all except *N. rustica*, but T1 failed to infect tobacco, *N. rustica*, *N. repanda*, or *N. sylvestris*. On *Zinnia*, the symptoms induced by T1 consisted of mild, localized necrosis and those by T6, T8, and T9 of severe, coarse mottle with stunting.

All the viruses so far fully described from crucifers are infectious to turnip. The four isolates described here, however, differ in one point or another from all previously described viruses and from each other, but they are considered sufficiently similar to the turnip mosaic virus to be regarded as strains of it and as distinct from the cauliflower mosaic virus group.

Walker (J. C.), LeBeau (F. J.), & Pound (G. S.). **Viruses associated with Cabbage mosaic.**—*J. agric. Res.*, lxx, 12, pp. 379–404, 6 figs., 1945.

The authors describe two distinct viruses, tentatively designated cabbage viruses 'A' and 'B', found in cabbage plants affected with mosaic [*R.A.M.*, xix, p. 65] in the Middle West and in western Washington. In the original study of cabbage mosaic the virus agent was found to have a wide host range. On tobacco only local lesions were produced, and when the virus extract was heated to several degrees higher than 55° C. the symptoms induced on cabbage differed from those of the original extract. This virus was named 'B'. When sap of non-cruciferous plants inoculated with cabbage mosaic extract was used for inoculating cabbage the symptoms differed in certain respects and the virus thus obtained was termed 'A'. Cabbage virus A was favoured by relatively high air temperatures and B by low ones. Virus A has a shorter incubation period than B by several days and usually first caused a mottle at 28° C., whereas B usually caused vein-clearing and a mild diffuse mottle. Cauliflower mosaic virus causes a more severe disease reaction in cauliflower than in cabbage, while the reverse is true in the case of cabbage virus B. Cabbage virus A causes typically chlorotic and mottle effects and the black ring virus produces dark green rather than chlorotic rings and necrotic ring spots. Cabbage virus A and the black ring virus are closely related to the turnip virus described by Hoggan and Johnson [ibid., xiv, p. 731], from which the

cauliflower mosaic virus is quite distinct. The ring-necrosis virus of Larson and Walker [ibid., xx, p. 507] has a similar host range, although the properties reported are different. Cabbage virus B is regarded as a strain of the cauliflower virus and related to the virus from broccoli described in southern England by Caldwell and Prentice [ibid., xxii, p. 122].

The authors conclude that cabbage virus A, the cabbage black ring virus, and the cabbage ring-necrosis virus may be regarded as strains of turnip virus 1 [turnip mosaic virus], and that the cauliflower mosaic virus as described by Tompkins should be designated as cauliflower virus 1 [cauliflower mosaic virus], of which cabbage virus B and the broccoli virus of Caldwell and Prentice may be designated as strains.

Diseases of Lettuce.—*Agric. Gaz. N.S.W.*, lvi, 6, pp. 251–254, 272, 7 figs., 1945.

Brief, popular descriptions are given of the following diseases of lettuce occurring in New South Wales, with recommendations for their control: spotted wilt [tomato spotted wilt virus: *R.A.M.*, xv, p. 538], stated to be the most serious of all, rendering lettuce-growing unprofitable in parts of the Sydney area in bad wilt years, the presence in the vicinity of the crops of alternate hosts of the virus undoubtedly being responsible for the prevalence of disease; downy mildew [*Bremia lactucae*], usually more important in the winter and early spring crops; *Sclerotinia* rot [*S. sclerotiorum*], damping-off, bottom rot (*Rhizoctonia* [*Corticium*] *solani*), *Septoria* leaf spot [*S. lactucae*], grey mould [*Botrytis cinerea*], bacterial rots, tipburn (non-parasitic), and leaf-yellowing and stunting (usually due to magnesium deficiency).

Kramer (M.), Orlando (A.), & Silberschmidt (K. M.). **Estudos sôbre uma grave doença de virus, responsável pelo deperecimento de nossos culturas de Alface.** [Studies on a serious virus disease responsible for the dying-off of our Lettuce crops.]—*Biológico*, xi, 5, pp. 121–134, 2 pl., 1945. [English summary.]

Lettuce crops in São Paulo, Brazil, have recently sustained heavy damage from a disease characterized by arrested growth, failure of head formation, and chlorotic and necrotic leaf spots, which is attributed to the agency of the lettuce mosaic virus. Losses in stands located on old soil, where seed of local origin has been sown for years in succession, may amount to 100 per cent., while even in plantings of United States seed on virgin soil the incidence of infection at the end of February, 1945, reached 10 or 12 per cent.

Experimental transmission of the disease was effected by means of the aphids *Myzus persicae*, *Macrosiphum sonchi*, and *M. solanifolii*, of which the last-named was distinctly less efficient than the other two, the relative percentages of successful tests on the Sem Rival, Big Boston, and Wayahead varieties being 100, 95·7, and 47, respectively. Particular interest attaches to the positive results obtained with *M. sonchi*, which was suspected as a vector of the disease in England [*R.A.M.*, xiv, p. 730], but is not known to act in this capacity in the United States. The virus was also shown to be transmitted through the seed to the extent of 5 to 15 per cent.

Lettuce mosaic may be combated by the use of selected, healthy seed, periodical roguing of infected plants, and of any weeds likely to harbour the virus, notably such Compositae as *Sonchus asper*, *Hypochoeris brasiliensis*, and *Senecio* sp., and the application to the plantings of nicotine sulphate sprays.

Ochoa (L.). **Mosaico amarillo. Nota sobre las semillas de los Frijoles en relación con esta enfermedad.** [Yellow mosaic. A note on Bean seed in relation to this disease.]—*Rev. Agríc. Habana*, xxvii, 28, pp. 17–19, 2 figs., 1944.

None of the 137 bean plants of two varieties raised from seed of yellow mosaic-infected plants at the Santiago de las Vegas Experiment Station, Cuba, developed

the least trace of the disease, and it is therefore concluded that transmission does not occur to any appreciable extent through this channel. The aphids responsible for the conveyance of the bean yellow mosaic virus from infected to healthy plants in the United States are absent from Cuba, but very active and efficient vectors, as yet unidentified, evidently exist in the latter country.

Bremer (H.). **On pod spots in Peppers.**—*Phytopathology*, xxxv, 5, pp. 283–287, 1 fig., 1 graph, 1945.

The author reports the occurrence in the Izmir (Smyrna) district of Turkey, and at the Central Institute of Plant Protection, Ankara, of a spotting of [chilli] pepper pods similar to that described by Weber from Florida as blossom-end rot [*R.A.M.*, xi, p. 803] and by Szirmai from Hungary as dry spot disease (heat injury) [ibid., xvii, p. 724]. The sunken lesions, bright-coloured at first, develop a hard, parchment-like texture under dry conditions, while in damp weather they may be overlaid by a shining, black mould, *Alternaria longipes*, which was shown by inoculation experiments, however, to enter the host exclusively through wounds. The disorder may result in the loss of 30 per cent. and upwards of the crop. From the limited data obtainable in the absence of adequate technical facilities, it appears that a disturbed water balance is the primary cause of both sun scald and blossom-end rot. Moderate but frequent irrigations should prevent the wide fluctuations in water supply which alone permit the normally beneficial action of strong solar radiation to assume a deleterious form.

Silberschmidt (K.) & Campos (A. R.). **Estudos relativos à doença 'superbrotamento' ou 'envassouramento' da Mandioca.** [Studies relating to the 'superbudding' or 'witches' broom' of Cassava.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 1–26, 4 pl., 1944. [English summary.]

The 'superbudding' or 'witches' broom' disease of cassava was first observed in Brazil (Minas Gerais) in 1939, and in 1941 its presence in São Paulo was confirmed. The outstanding features of the disturbance are severe stunting of the whole plant, curtailment of the internodes, and production of an abnormally large number of lateral branches by the axillary buds. The lamina is often slightly chlorotic and its area may be reduced. Plants raised from cuttings of diseased shoots show definite symptoms of 'superbudding', which were also sometimes observed even in material taken from apparently healthy specimens grown in infested fields.

Transmission of 'superbudding' was effected only by means of side- or 'bottle'-grafting, the latter having been described by Harland (*Trop. Agriculture, Trin.*, iv, p. 96, 1927) in connexion with the vegetative propagation of cotton. 'Bottle'-grafting was the more successful of the two methods, with positive results in six out of seven tests, each comprising two to 12 plants, the transmission percentages ranging from 25 to 50 per cent., while the corresponding figures for side-grafting were two out of ten (one to eight plants) and 12·5 to 25 per cent., respectively. The incubation ('pre-patent') period of the virus was three to four months. Two successful grafting experiments, comprising seven and five plants, respectively, were further performed with diseased cassava scions on healthy *Manihot glaziovii* stocks, but the percentages of transmission were only 20 and 28·5 per cent., respectively, and the incubation period at least twice as long as in the case of the intraspecific grafts.

The experimental results point to a virus as the agent of the 'superbudding' disease. Analogies between the cassava disorder and the published descriptions of other virus diseases involving witches' broom production lend support to this hypothesis, and the agreement between the 'superbudding' symptoms and those of some types of the cassava mosaic reported by H. R. A. Muller from Java [*R.A.M.*, xi, p. 152] suggest the identity of the two conditions. The discussion

concludes with a survey of the literature on the various disturbances of cassava to which the name of 'mosaic' has been applied.

CHEO (C. C.) & JENKINS (ANNA E.). **Elsinoe and Sphaceloma diseases in Yunnan, China, particularly Hyacinth Bean scab and scab of Castor Bean.**—*Phytopathology*, xxxv, 5, pp. 339–352, 5 figs., 1945.

Five diseases caused by *Elsinoe* and *Sphaceloma* spp. were observed by the first-named writer in Yunnan Province, China, in 1938–9, three of which, namely, rose and grape anthracnose (*S. rosarum* and *E. ampelina*, respectively), and sour orange scab (*E. fawcetti*), had already been recorded from the country [*R.A.M.*, xii, pp. 96, 395; xvi, p. 840], while the other two, viz., hyacinth bean (*Dolichos lablab*) scab (*E. dolichi*) and castor bean (*Ricinus communis*) scab (*S. ricini*) were apparently new. The presence of the former had been reported without a description by Hansford from Uganda [ibid., xiii, p. 290], and part of D. C. Edwards's material from Kenya became available in 1936 to Miss Jenkins, who was likewise furnished with specimens of the latter from Formosa by K. Sawada before its detection in China. Latin diagnoses of these two species have already been published [ibid., xxi, p. 45].

Inoculations with potato agar cultures of *E. dolichi* gave positive results on *D. lablab*, but were unsuccessful on sword and jack beans (*Canavalia gladiata* and *C. ensiformis*) and Lima beans (*Phaseolus lunatus*). Similarly, four castor bean varieties, i.e., green petiole with (*a*) large, smooth and (*b*) large, thorny capsules, and red petiole with (*a*) large, thorny and (*b*) small, thorny capsules, reacted positively to inoculation with *S. ricini* in all the tests except those in which the inoculum was (*a*) deposited on the lower leaf surface or (*b*) consisted of a weakly pathogenic, black saltant of the fungus. Comparative cultures of these two species and *E. phaseoli*, *E. fawcetti*, and *S. arachidis* showed all to be distinct.

KHAN (A. R.) & BHATNAGAR (M. P.). **Cowpea varieties and culture.**—*Indian Fmg*, vi, 5, pp. 212–213, 1945.

Studies carried out at Karnal since 1937 showed that the cowpea varieties referred to as Nos. 585, 700, 782, and 397 are resistant to wilt (*Macrophomina phaseoli*) [cf. *R.A.M.*, xiv, pp. 208, 742; xxiii, p. 187].

KUHNHOLTZ-LORDAT (G.). **Les appellations d'origine et le court-noué.** [Place-names denoting origin and court-noué.]—*Ann. Éc. Agric. Montpellier*, N.S., xxvi, 3, pp. 35–38, 1944.

The author states that, so far as is known at present, vine court-noué [*R.A.M.*, xxii, p. 195] is an incurable disease, which grows progressively worse every year until sterility (pathological 'coulure') [failure of the flowers to set: ibid., xviii, p. 724] develops. Growers appear to be unaware of the course of the disease, and think that vines are affected only when they show shortened internodes and present a bushy, stunted appearance; the earlier stages of the disease escape notice or are misunderstood. The first symptoms of court-noué (various deformations, such as flattening and bifurcation of the branches, fasciation, finely-cut leaf edges, and leaf-yellowing) often appear long before the shortening of the internodes; 'coulure' may even be present, and grow worse year by year.

When yield has been seriously reduced for some years, growers begin to remove the vines, starting with the rows most severely affected. The two or three rows nearest to the space left empty then begin to show signs of the disease. The removal of affected vines favours the spread of the condition. In the author's opinion, court-noué in its early stages is a physiological masking of the true causes of the progressive decline in yield, this decline being too often attributed to the state of fertility of the soil.

Healthy vines introduced into affected vineyards become affected, and rapidly so if diseased vines are removed a few at a time and replaced by healthy ones. Control, however, can be undertaken in the case of localities where no vine has been grown for a long time. These must be planted with entirely healthy vines, i.e., both graft and stock being unaffected. The search for healthy mother-vines and suitable localities to plant them in should be undertaken at once, and by specialists.

Sukhov (K. S.). **On certain conditions of formation of intracellular virus inclusions.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xlv, 4, pp. 169–172, 4 figs., 1944.

The author reviews recent work on intracellular virus inclusions and briefly indicates the results of his own work on the viruses of tobacco mosaic, winter wheat mosaic, and oats pseudo-rosette [*R.A.M.*, xxiii, p. 257; xxiv, p. 167].

Wallace (G. B.) & Wallace (Maud M.). **Tanganyika Territory fungus list: recent records. VI.**—*Mycol. Circ. Dep. Agric. Tanganyika* 15, 2 pp., 1945. [Mimeographed.]

Two distinct leaf spots of cauliflower have recently been noted in Tanganyika Territory, viz., dark leaf spot, already recorded locally on cabbage, caused by *Alternaria circinans* [*A. oleracea*], and brown rot, due to *A. brassicae* (Berk.) Bolle [*A. brassicae* (Berk.) Sacc.]. Brown rot has also been observed on turnip.

New records for the Territory since December, 1944, include leaf spot (*Cercospora beticola*) of spinach beet [*Beta vulgaris* var. *cicla*], bitter rot (*Glomerella cingulata*) of apples and pears, leaf spot (*C. viticola*) [? *C. vitis*: *R.A.M.*, xv, p. 200; xxi, p. 324] of vine, leaf blotch (*Rhynchosporium secalis*) of barley, crown rot (*Puccinia coronata*) and leaf spot (*Helminthosporium avenae*) of oats, leaf spots of sorghum due to *H. turcicum*, *Colletotrichum graminicola*, (?) *Gloeocercospora sorghi* [ibid., xxii, p. 302], and a species of *Cercospora* other than *C. sorghi*, stem disease (*Plenodomus destruens*) [ibid., xi, p. 535] of sweet potato, stem and root rot of the same host due to *Macrophomina phaseoli*, root disease (*Rhizoctonia bataticola*) [*M. phaseoli*] of soy-bean, and anthracnose of ginger leaves, possibly due to *Colletotrichum zingiberis*.

Bacterial ring rot (*Xanthomonas solanacearum*) was found in potato plots planted with seed from Kenya. The same organism also caused a serious wilt of tomatoes at Lyamungu.

Wallace (G. B.). **Report on a plant disease survey in the Lake and Western Provinces and on the Central Railway, March–April, 1945, by the Plant Pathologist.**—*Mycol. Circ. Dep. Agric. Tanganyika* 17, 11 pp., 1945. [Mimeographed.]

The sweet potato disease, apparently of virus origin, recently described by Hansford from Uganda [*R.A.M.*, xxiv, p. 117], was seen by the author in March and April, 1945, at Bukoba, Biharamulo, Ngara, Mwanza, Shinyanga, Tinde, Tahora, Kigoma, Kasulu, Dodoma, Morogoro, and Korogwe, Tanganyika Territory, and was also reported from Amani. The same virus disease, apparently, was also found on six wild species of *Ipomoea* in widely separated localities. Stem disease (*Plenodomus destruens*) [see preceding abstract] was also found in all areas visited, except Morogoro, though it is doubtless present there too; at Ngara, it was at least as severe as the virus disease.

Cassava mosaic was present everywhere, but no brown streak [ibid., xxii, p. 7] was noted. The only record of brown streak in the Lake Province is an observation by F. W. Thomas, who noted definite symptoms at Karagwe. Cassava strains bred at Amani and resistant to mosaic are being multiplied for distribution to native

growers. Cassava leaf spot due to *Cercospora henningsii* [ibid., xxi, p. 242] was present everywhere, but unimportant.

Even young sorghum showed the presence of downy mildew (*Sclerospora sorghi*) [ibid., xviii, p. 517; xix, p. 72]. The diseased plants have a characteristic bunched, upright growth, and where the healthy plants are of an even height, they appear taller than the latter; they seldom form ears. All affected plants should be removed.

The solar method of treating sorghum seed against grain smut [*Sphacelotheca sorghi*: cf. ibid., xx, p. 289], in which the seed is soaked in water for four hours and then dried in the shade, was used successfully at Ukiriguru, but at Morogoro the treated seed failed to germinate. The leaf spots produced on sorghum by *Gloeocercospora sorghi* [ibid., xxii, p. 302] were very variable in colour and shape, but all were recognized as the same disease by the presence of raised, black sclerotia, generally present in lines on both surfaces of the spots.

Bulrush millet [*Pennisetum typhoides*] downy mildew (*Sclerospora graminicola*) [ibid., xi, pp. 507, 634] is moderately common; young plants should be destroyed directly they become infected. Rice near Mwanza was affected by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*]. Cowpeas at Nyamahona showed intense infection by mosaic [ibid., xxi, p. 282], but the effect on the crop was very mild. Rust (*Uromyces vignae*) [ibid., xviii, p. 91] was also present, and both diseases were noted at Fela also; brown leaf spots and marginal light brown areas on cowpeas at Ukiriguru were probably due to *Bacterium* [*Pseudomonas*] *vignae* [ibid., xv, p. 772; xxiii, p. 469]. Yams [*Dioscorea* spp.] at Bukoba were affected by leaf spot (*Cercospora carbonacea*) [ibid., vi, p. 602].

Fifty-seventh Annual Report of the Rhode Island Agricultural Experimental Station.—39 pp., 1945.

The following items in this report may be mentioned [*R.A.M.*, xxiv, p. 138]. Isothan Q15 (lauryl isoquinolinium bromide), used at a dilution of 1 in 5,000, gave 94 per cent. control of apple scab [*Venturia inaequalis*] on McIntosh foliage when unsprayed trees showed an average of 11 scab lesions per leaf. This record equals the control given by Camden sulphur at 10 lb. per 1,000 gals. and is superior to fermate, used at 1½ lb. per 100 gals. in the same test. Furthermore isothan Q15 inactivates scab lesions and gives greater latitude in timing spray applications with equal control. Complete coverage is obtained with less solution. It is compatible with lead arsenate and nicotine sulphate and no discomfort was experienced by the user. This fungicide is the best so far tested in the experimental orchard, although some injury was caused at concentrations of 1 in 2,000.

An organic mercury-containing spray, puratized N5–D at a toxicant concentration of 1 in 20,000 in water, again provided almost perfect control of apple scab as in the 1943 trials. Military requirements continued to make this fungicide unavailable for use.

Treating apples with heavy concentrations of carbon dioxide for short periods at the start of the storage season promises effective control of scald of Rhode Island Greenings.

On certain potato plantations, sulphur was added to the soil to increase the acidity and lime added to other plots to produce a more neutral reaction. The yield was found to increase with an increase in P_H up to 5·5, but fell when the P_H was above 6·0. Below P_H 5·5, scab was insignificant, but rose to 15 per cent. between P_H 5·5 and 6·0, and to 21 per cent. above P_H 6·0. Plots treated with limestone produced more scabby potatoes than those treated with gypsum (which did not change the acidity) even though the latter received twice as much CaO. It is concluded that the increase in P_H from the limestone caused more scab than the increase in available calcium from the gypsum.

An experiment in determining the effect of rainfall on the pathogenicity of *Pseudomonas medicaginis* var. *phaseolicola* was undertaken with two lots of Asgrow stringless Black Valentine beans presumed free from halo blight, one from Idaho and the other from California. Disease readings for the former showed 10 per cent. of the leaves attacked, and for the latter 3 per cent. and none on the pods. French horticultural beans planted near by showed 100 per cent. infection. The source of bean seed is therefore an important factor in disease control.

Tobie (W. C.). **A proposed biochemical basis for the genus Pseudomonas.**—*J. Bact.*, xlix, 5, pp. 459–462, 1945.

A. G. Lochhead has recently (*J. Bact.*, xlv, p. 574, 1943) proposed the enlargement of the genus *Pseudomonas* [*R.A.M.*, xxiii, p. 476] to include the red, halophilic bacteria hitherto assigned to *Serratia*, and this suggestion is supported by the writer, who further advocates the transference to the former of rod-shaped organisms producing water-soluble phenazine pigments, regardless of their colour, or water-soluble, fluorescent pigments, or both. Such pigments apparently play an important part in the life-history of the bacteria secreting them, and may therefore well serve as a biochemical basis for the reclassification of the group on more rational lines than those hitherto adopted.

Tervet (I. W.). **The microflora of Wheat and Barley seed grown in Minnesota and the Dakotas in 1944.**—*Plant Dis. Reptr*, xxix, 19, pp. 474–487, 5 maps, 1945. [Mimeographed.]

In comparison with 1943 [*R.A.M.*, xxiv, p. 13], seed of the 1944 wheat crop was less heavily infected with seed-borne pathogens. Laboratory tests failed to confirm field observations of severe infection by *Gibberella zeae*, and it is thought that conditions favouring infection may have lasted only a short time while the grain was in a susceptible stage. *Helminthosporium* spp. were again the predominant pathogens on barley seed, particularly in South Dakota and central Minnesota. *G. zeae* occurred in a moderate amount.

Fuggles-Couchman (N. R.) & Wallace (G. B.). **Cultivation and diseases of Wheat.**—*Pamphl. Dep. Agric. Tanganyika* 38, 19 pp., 1945.

In the section of this pamphlet dealing with wheat diseases in Tanganyika Territory (pp. 13–19) it is stated that six physiologic races of stem rust (*Puccinia graminis*) (K1 to K6) have been recognized locally [*R.A.M.*, xiii, p. 217; xix, p. 71], and all the widely grown wheat varieties are attacked, except 192. In 1942, yellow rust (*P. glumarum*) was general in the Northern Province, and since then it has become progressively more severe. In 1943 it was observed in the Lushoto District. In Tanganyika, varieties lose their resistance at much lower altitudes than in Kenya. Intensity of infection increases everywhere with altitude. In the Northern Province, wheat is grown down to 4,300 ft., at which elevation the leaves of Kenya Governor, 192, and Simpson's L 3 are affected; the leaves of Australian are attacked at 4,400 ft. and of Simpson's Rongai at 4,500 ft. Reward shows leaf infection at 4,500 ft., B 256 G at 5,900 ft., and Reliance at 5,800 ft. Direct infection of the florets occurs only at much higher elevations. Fields not found infected were 58 F (L 1), 112 A, 117 A, and Sabanero at various altitudes between 4,500 and 6,000 ft. The destruction of volunteer wheat, particularly in the moister and higher localities, would probably reduce the sources of infection at the beginning of the following season.

Leaf rust (*P. triticina*) occurs at all elevations at which the crop is grown, but is less important. Before harvest, Kenya Governor seemed more resistant than 192 or the Simpson wheats. Black chaff (*Bacterium translucens* var. *undulosum*)

[*Xanthomonas translucens* var. *undulosa*: ibid., xxii, p. 16] has been abundant only occasionally. Glume blotch (*Septoria nodorum*) is more common. Loose smut (*Ustilago tritici*) calls for little attention. *Gibberella saubinetii* [*G. zeae*] produces head blight, but is not serious.

Walker (A. G.). **Rhizomatous grass weeds and Ophiobolus graminis (Sacc.).**—*Ann. appl. Biol.*, xxxii, 2, pp. 177–178, 1945.

The author describes an examination of grass plants taken in 1944 from a field sown successively with silage mixtures, potatoes, and wheat, which established the presence of *Ophiobolus graminis* on *Agropyron repens*, *Agrostis* spp., and *Holcus lanatus*, surviving from sods undecomposed when the field was ploughed up after bearing the silage crops [*R.A.M.*, xxiii, p. 338]. Washed roots of *Agropyron repens* and *Agrostis* spp., examined under the binocular dissecting microscope, showed roots, apparently clean, bearing mycelium, the rhizomes of *Agropyron repens* being covered in plate mycelium [ibid., xiv, p. 622] where infection was severe; while *Agrostis* spp., although mildly attacked, showed runner hyphae, and must be regarded under field conditions as a host plant whose danger lies in its abundance and wide distribution. Only a few plants of *H. lanatus* were present and 35 per cent. of these showed infection compared with 69 per cent. for *Agropyron repens* and 27 per cent. for *Agrostis* spp. Adequate cultivation is required to destroy such potential sources of infection as these weeds.

Coffman (F. A.), Heyne (E. G.), Johnston (C. O.), Stevens (H.), & Murphy (H. C.). **Improvement and distribution of spring-sown Red Oats.**—*J. Amer. Soc. Agron.*, xxxvii, 6, pp. 479–498, 1 fig., 1945.

In 1926 a co-operative hybridization programme was introduced for the breeding of oats of the Fulghum type for resistance to smut [*Ustilago avenae* and *U. kolleri*: see next abstract], crown rust [*Puccinia coronata*], and stem rust [*P. graminis*: *R.A.M.*, xxi, p. 251; xxiii, p. 97] in the spring-sown red oats region, extending from coast to coast across the central portion of the United States, exclusive of the Rocky and Appalachian Mountains and western desert areas. From crosses then made, the smut-resistant variety, Fulton, was developed and distributed to Kansas farmers in 1939.

In 1929 the South American Victoria, which is exceptionally resistant to *P. coronata*, was crossed with Red Rustproof in Idaho, and later with many other varieties. From a Victoria × Richland cross have sprung the disease-resistant, early-maturing Boone, Cedar, Control, Tama, Vicland, and Vikota [ibid., xxiv, p. 356], which are being extensively grown in the Corn Belt proper and to some extent in the spring-sown red oats zone. In 1935 the more promising selections available in Kansas were mated with crown and stem rust-resistant segregates from the Victoria × Richland cross. The selected offspring of these crosses include a number of very desirable, early-maturing, prolific, rust- and smut-resistant varieties, e.g., Ventura, already distributed in California, and Osage and Neosho, which have been increased for distribution in Kansas in 1945. Crosses have been made to add rust resistance to the other attractive qualities of Columbia, and to combine in otherwise satisfactory varieties resistance to race 45 of *P. coronata* and 8 and 10 of *P. graminis*.

To sum up, as a result of the breeding programme, varieties are now available for the spring-sown red oats area combining reasonably good plant and grain characters with resistance to all the more common races of the rusts and smuts. There is room, however, for further improvements in growth habit, as well as for resistance to some of the new and threatening races of the diseases under observation, and the present activities of the programme are focussed on the correction of these deficiencies.

Hansing (E. D.), Heyne (E. G.), & Melchers (L. E.). **Studies on smut-resistant Oats for Kansas.**—*J. Amer. Soc. Agron.*, xxxvii, 6, pp. 499-508, 1945.

Some of the information presented in this paper has already been noticed [see preceding abstract]. In 1935 and 1936 Fulton, a selection from a cross between Fulghum and Markton oats, was shown to be intermediate in susceptibility to a new physiologic race of loose smut (*Ustilago avenae*) designated the 'Fulton smut'. Kanota and Fulghum were susceptible, Columbia and Marion moderately so, and Richland, Markton, Trojan, Brunker, Otoe, New Nortex, Tama, Boone, Fultex, and Victoria highly resistant to the new race. In 1935 two crosses were made between Fulton and Victoria × Richland and several additional ones between Fulghum × Markton and Fulghum × Richland selections. Most of the Fulton × (Victoria × Richland) selections, including the promising Osage and Ventura, eventually developed an intermediate degree of susceptibility to the 'Fulton smut', whereas most of those derived from (Fulghum × Markton) × (Victoria × Richland), including Neosho and C. I. 4140, were highly resistant.

All the varieties and hybrid selections included in the trials herein described were resistant to the Fulghum smut except Fulghum, Kanota, Frazier, and Fowld's Hulless, while the last-named and Richland were the only two showing appreciable susceptibility to the Richland race.

Roll-Hansen (F.). **Undersøkelse av Gibberella saubinetii (Mont.) Sacc. som fotsyke på Havre 1940.** [Investigation of *Gibberella saubinetii* (Mont.) Sacc. as foot rot of Oats 1940.]—*Meld. St. Frøkontr. Ås, 1939–40*, pp. 32–38, 1941. [Received September, 1945.]

It is concluded from the results of experiments in 1940 on the control of foot rot of oats (*Gibberella saubinetii*) [*G. zeae*] in Norway that the principal source of infection lies in the seed; that there is little spread of the disease from row to row, at any rate in the early summer; that little or no contamination arises from the soil; and that seed treatment with ceresan or germisan is not altogether effectual.

Vergani (A. R.). **Transmisión y naturaleza de la 'lepra explosiva' del Naranjo.** [Transmission and nature of 'lepra explosiva' of the Orange.]—[*Publ.*] *Minist. Agric. B. Aires*, Ser. A, i, 3, 4 pp., 4 figs., 1945.

Particulars are given of experiments at Bella Vista, Corrientes, Argentina, on the transmission of 'lepra explosiva' of the orange [*R.A.M.*, xxi, p. 486], which was effected solely by means of the artificial infestation of the trees with the Acarid, *Tenuipalpus pseudocuneatus*. The disease is therefore attributed to the agency of toxins secreted by the insects. Excellent control has been secured over a period of seven years by the application to the affected trees of appropriate insecticides.

Smith (C. O.) & Klotz (L. J.). **A more virulent black pit organism on Citrus.**—*Calif. Citrogr.*, xxx, 10, p. 303, 1 fig., 1945.

From brownish, depressed spots, 1·5 in. in diameter, found on lemon and Valencia orange fruits in Californian groves, either alone or in association with lesions due to *Phytomonas* [*Pseudomonas*] *syringae* [*R.A.M.*, xxiii, p. 128], the authors isolated an organism which gave a form of growth typical of black pit and on inoculation produced spots up to 1·5 in. in diameter. As spots of this size have not before been found in nature, the isolates in question appear to be highly virulent.

Godfrey (G. H.). **A gummosis of Citrus associated with wood necrosis.**—*Science*, N.S., cii, 2640, p. 130, 1945.

A type of gummosis [*R.A.M.*, xxi, p. 128], described as the most prevalent and serious citrus disease in the Lower Rio Grande valley, Texas, arises from cracks

in the bark, overlying and connected with irregular bands of necrotic wood, the greater part of which lies well beneath the outer wood layers, the longitudinal sections being usually several times the lateral spread in extent. Affected wood is firm, and only slightly darker than normal, except that the advancing border region is more or less salmon-pink and becomes brighter soon after exposure to the air. An organism resembling a species of *Actinomyces* is suggested by the detection of hyphae of extremely small diameter and what appear to be spores of equal size budding off their tips; and it was observed making an inter- and intracellular advance through the tissues in the medullary rays as well as in the longitudinal fibres. The secondary invader, *Diplodia natalensis* [ibid., xxiv, pp. 188, 189], has been located in the dead wood in the older necrotic regions.

The disease occurs commonly in sweet orange, grapefruit, and the Meyer lemon. Characteristic necrotic bands, followed by gummosis, have been produced in healthy branches by inoculation with pink border wood into a chisel wound, but all attempts to isolate the primary organism have failed. It seems clear that the disease is parasitic and points of entrance have been found in unprotected pruning wounds, in branches broken by a storm, in wood injured and cracked by freezing, and in bark injuries made by the shoes of pickers and pruners. The rapidity with which the disease spreads is shown by the fact that an advance of 1½ ft. downward in 30 days has been observed. However, as the downward spread appears to stop at the line of bud union between the rootstock and the top, the sour orange rootstock would seem to be immune.

Haas (A. R. C.). **Boron in Citrus trees.**—*Plant Physiol.*, xx, 3, pp. 323–343, 8 figs., 1945.

The author found gum present in the peel of lemon and orange fruits, in the core of orange fruits, and filling the woody tissues of trees grown in solution cultures lacking boron [*R.A.M.*, xvii, p. 519]. Gum exuded from cut surfaces and protruded through the bark. The intracellular presence of gum, denoted by translucent spots, contributed to leaf distortion, often with subsequent destruction of the terminal meristematic tissue and growing points in twigs. No single symptom can be considered, however, as characteristic or specific for boron deficiency or excess. The boron content of orange juice varies with the soil on which trees are grown. In the case of Valencia orange fruits, boron content is observed to increase with age; and treatment of soil with boron in various quantities increased the water-soluble boron content of the leaves of Navel orange trees and of the fruit pulp. In dried citrus tissues, a large amount of boron insoluble in distilled water was found to be soluble in weak acid.

Childs (J. F. L.) & Siegler (E. A.). **Scientific apparatus and laboratory methods; compounds for control of Orange decays.** *Science*, N.S., cii, 2638, p. 68, 1945.

Fruit decays caused either by stem-end rot (*Phomopsis* [*Diaporthe*] *citri* and *Diplodia natalensis*) or the blue and green mould organisms (*Penicillium digitatum* and *P. italicum*) have been the subject of prolonged investigation by the United States Department of Agriculture Subtropical Fruit Field Station, Florida. Treatment of the fruit with the otherwise strikingly satisfactory control agent thiourea [*R.A.M.*, xxiv, p. 147] cannot be recommended until extended feeding tests have been completed. As a result of a search for less objectionable compounds of equal efficacy it has been found that thioacetamide, 8-hydroxy quinoline sulphate, and 2-aminthiazole, provide a satisfactory measure of control, immersion of oranges from 2 to 5 seconds in 5 per cent. solutions of these substances reducing percentage decay from 32·9 to 1·7, 32·6 to 10·5, and 42·2 to 7·5, respectively. The presence of both an amino group and sulphur is at once common to the chemical structure

of these compounds and essential to their successful fungicidal activity. As in the case of thiourea, however, these three compounds may require considerable toxicity investigation before they can be accepted for use.

Schopfer (W. H.). **La biotine, l'aneurine et le méso-inositol, facteurs de croissance pour Eremothecium ashbyii Guilliermond. La biosynthèse de la riboflavine.** [Biotin, aneurin, and meso-inositol, growth factors for *Eremothecium ashbyii* Guilliermond. The biosynthesis of riboflavin.]—*Helv. chim. Acta*, xxvii, 5, pp. 1017–1032, 1 fig., 1944.

Eremothecium ashbyii, a parasite of cotton capsules [*R.A.M.*, xv, p. 719], was found to grow well on various natural media, e.g., wheat germ, potato, oats, and beet extract agar, riboflavin production being most abundant on the first two and also on peptonized substrata, which supported only moderate development of the fungus. Biotin (vitamin H) was shown to be an essential growth factor for *E. ashbyii*, whereas aneurin (vitamin B_1) and meso-inositol were merely complementary, intensifying the action of the first-named. In this respect, as in others, *E. ashbyii* resembles *Nematospora gossypii*, but the auxo-heterotrophy of the former is more marked than that of the latter.

Barducci (T. B.), García Rada (G.), & Wille (J.). **Control of internal boll rot of the Cotton plant, caused by insect punctures (Dysdercus sp.), through selection of resistant strains.**—*Nature, Lond.*, clvi, 3956, pp. 235–236, 1 fig., 1945.

Following up the work of R. L. Steyaert on the selection of cotton for resistance to stigmatomycoses in the Belgian Congo [*R.A.M.*, xviii, p. 797], the writers isolated from rotten bolls, naturally infected in the northern coastal regions of Peru through cotton-stainer (*Dysdercus ruficollis*) punctures, bacteria, an unidentified fungus, *Alternaria* sp., and *Acremonium* sp., of which the two last-named appear to be the most virulent. *Nematospora* spp. did not develop. Inoculation experiments with the several organisms on four bolls from each of 160 selected plants resulted in the complete rotting of a large percentage, but 12 plants of four strains proved to be resistant, especially No. 16–38 (LM No. 7–35 group). It would appear from these preliminary data that the Peruvian varieties (*Gossypium barbadense* var. *peruvianum*) used in the authors' experiments are genetically more resistant to internal boll rot associated with stigmatomycosis than the American *G. hirsutum* with which Steyaert worked.

Progress Reports from Experiment Stations, season 1943–44.—176 pp., 1 pl., London, Empire Cotton Growing Corporation, 1945.

The following items of interest are presented from these reports [cf. *R.A.M.*, xxiii, p. 296]. At Barberton, South Africa, experiments on red loam soil to test the effect of various elements, potash and dolomite limestone on the general development of the cotton crop, showed that on all plots not receiving potash growth fell away early, although growing conditions were still good, and *Alternaria* spread rapidly. Plots receiving potash, either alone or in combination, maintained their growth for a few weeks longer, but were finally attacked by *Alternaria* in the same way. This extra growth increased their mean yield to 1,080 lb. per acre of seed cotton, compared with a mean of 485 lb. from all others.

Blackarm (*Bacterium* [*Xanthomonas*] *malvacearum*) causes moderate to serious direct loss in southern and central Gezira and in the Gash territory when climatic conditions favour rapid dissemination of the pathogen. Tokar is almost free from the disease because of its climate. Control in the Gezira is sought by seed disinfection (abavit B), delayed sowing, root-pulling and burning after cropping, and by collecting and burning débris, all costly and laborious measures. Sufficient control

is, however, secured by these means to make the indirect effects of blackarm more serious than the direct crop loss. Delayed sowing, for example, reduces the average grade of the crop, and thus causes considerable loss. Other effects of blackarm are to restrict the southern Gezira, on the one hand, to producing X1730A (which is able to grow away from the disease), although it might prove desirable to grow Sakel in the south, and the Gash territory, the seed farm of the Gezira, on the other, to growing only such varieties as are required by the Gezira authorities. Clearly the indirect effects of the disease emphasize the importance for Egyptian cotton production of developing blackarm-resistant varieties.

In breeding for blackarm resistance X1730 (BAR.1730L) in the Gezira proved to be typical X1730 in every way, but capable of outyielding the commercial X1730A wherever blackarm was present. This strain will be sown on an increased area next season. Some 6,500 feddans in the Gezira will be sown next season with blackarm-resistant N.T.2 (BAR.2.41) seed, following successful raising of this seed in the Gash. Selection within the blackarm-resistant strains of X1730 and N.T.2 carrying B_2 began in 1942–3, and some of the best progeny rows in each type were bulked this season for sowing in nucleus multiplication plots. In other work the transference of blackarm immunity from *G*[*ossypium*] *sanguineum* to Sakel was taken to the third Sakel stage.

A repetition of the ravages caused by leaf curl some years ago has been prevented by root-pulling at the end of each season, growing X1730A in the Southern Gezira, Tokar, and part of the Gash, enforcing a dead season for 'bamia' (*Hibiscus esculentus*), and encouraging the growth of leaf curl-resistant Momtaza 'bamia' in preference to the local type. The disease, however, is still a potential danger throughout all the Egyptian cotton areas in the Sudan. Twelve strains, tested against Domains Sakel, included the latest of the blackarm-resistant N.T.2 and X1730 strains, which, like their parents, were highly resistant to leaf curl. Massey's Domains Sakel, selected from the previous season, also showed very high resistance, 6 per cent. at the end of March as against 48 per cent. for the control.

The establishment in 1938–9 at Bukalasa, Uganda, by the method of covariance of large and statistically significant differences between families in resistance to *Verticillium* wilt, showing BP.50 as the most susceptible, B.181 as highly resistant, and BP intermediate with a resistance capacity comparable with Buganda Local, which at that time served as a control, has encouraged an attempt to establish a genetic basis for resistance, and the stage has now been reached where pollen has been transferred from wilted plants of a susceptible substrain of BP.50 to healthy plants of a resistant substrain of B.181. The hybrid progeny will receive a soil inoculation of *Verticillium* and be selfed and back-crossed both ways.

In Nigeria blackarm does not normally reduce appreciably the yield of Allen. Native cotton from Sokoto (*Gossypium peruvianum*) is markedly resistant to leaf curl.

Steyn (D. G.). **Fungus-infected and fermented stock feed.**—*Emg S. Afr.*, xx, 232, pp. 429–430, 448, 1945.

Referring to suspected cases of poisoning of stock through fungus-infected feeds, the author, after pointing out that maize cobs and stalks infected with *Diplodia zeae* may produce symptoms of paralysis [*R.A.M.*, xviii, p. 460], while *Paspalum* grass infected with *Claviceps* [*paspali*: ibid., xxi, p. 22] may cause hypersensitiveness and other symptoms, states that the main problem is the mixed fungal infection to which so many feeds are subject. The quantity of air in the feed, its moisture content, the temperature at which fungal growth takes place, and the degree of acidity of the feed are the main factors in determining toxicity. Over 20 types of symptoms induced are listed.

Houston (B. R.). **Two important Flax diseases in California in 1945.**—*Plant Dis. Reptr*, xxix, 21, pp. 570–571, 1945. [Mimeographed.]

The author reports the isolation, for the first time in California, of *Fusarium lini* from the stem and root tissues of flax plants from the Imperial Valley. Varieties of Punjab C.I.20 and Argentine (Calar) C.I.463, planted in soil inoculated with cultures of the fungus, died in 10 days; Argentine seemed slightly more resistant than Punjab.

A survey of the flax-producing area of central California disclosed 40 per cent. of the crop in early-planted fields as severely attacked by [beet] curly-top virus [*R.A.M.*, xxiii, p. 486] with an estimated average of 8 to 10 per cent. for the whole area. The autumn migration of the leaf-hopper vector, *Eutettix tenellus* [ibid., xxi, p. 511], coinciding with the seedling stage of the flax plants, is regarded as responsible for the severity of infection in the earlier fields. Tests of 19 flax varieties for reaction to the curly-top virus showed 80 to 95 per cent. infection in the case of 11 varieties, including Argentine, Calar Foundation, C.I.980, C.I.1049, and Punjab, six with 65 to 80 per cent., Rio × Roman Winter–5 variety with 50 to 65, and C.I.1009 with 20 to 35 per cent. infection and, therefore, regarded as relatively resistant.

Hoyman (W. G.). **Pythium aphanidermatum on Arizona Flax in the Salt River Valley.**—*Plant Dis. Reptr*, xxix, 21, pp. 569-570, 1945. [Mimeographed.]

This paper reports the isolation of *Pythium aphanidermatum* [cf. *R.A.M.*, x, p. 731] and *Fusarium* spp. on diseased roots of Arizona flax, plants of nine varieties of which, seeded on 23rd October, 1944, were found in the following January to have died during the seedling stage, their roots exhibiting symptoms of general necrosis and the surviving plants a yellowish foliage and weakly appearance. Seed of Argentine (pale blue), Bison × Abyssinia, Calar, Indian type, Ottawa × Bison (C.I. 1036), Ottawa × Bison (C.I.1040), Punjab, Viking, and 2558–2–C (Canada), planted in 10-in. pots containing steamed soil, infested with a recent isolate, all proved susceptible.

Johansen (Gudrun). **Hørsygdomme.** [Flax diseases.]—*Tidsskr. Planteavl*, xlviii, pp. 187–298, 2 col. pl., 17 figs., 1943. [Received August, 1945.]

This is an expanded account of the writer's studies on flax diseases in Denmark, a notice of which has already appeared from another source [*R.A.M.*, xxii, p. 433]. The present version contains much additional information, including the following. In August, 1942, the Concurrent variety at the State Phytopathological Experiment Station, Lyngby, was attacked by a mildew with spores measuring 29 to 38 by 13 to 16 μ (average 33 by 14·8 μ), thus corresponding to Škorić's *Oidium lini* and the mildew described on flax by Salmon and Ware [ibid., vi, p. 727].

Fusarium avenaceum was responsible for a brown discoloration and wilt of flax plants in north Jutland in 1940. Inoculation experiments showed the fungus to be actively pathogenic [ibid., xviii, p. 315], reducing the proportion of germination from 100 to 3 per cent. Another species of *Fusarium* with naviform, pedicellate, mostly triseptate conidia, 33·4 by 3 to 4 μ, inducing similar symptoms, proved to be only a weak parasite. *F. culmorum* [loc. cit.] also commonly developed on seed placed for examination on potato dextrose agar.

A species of *Phoma* found on young linseed plants in 1941, producing olive-green, later light brown, irregular, sharply delimited lesions on the leaves and cotyledons and reddish-brown spots and stripes on the root-collar was characterized by spherical, chestnut-brown pycnidia, 80 to 180 μ in diameter, with a pale-centred pore 12 to 17 μ in width, and hyaline, narrow ovate-ellipsoid spores, 5 to 7 by 2·5 to 3 μ: it is presumed to be identical with *P. exigua* [ibid., xviii, p. 316]. Another species closely resembling *P. lini* [ibid., xviii, p. 315] but with

smaller pycnidia (90 to 180 μ in diameter) caused exceptionally severe damage to the Canadian spinning flax variety, J.W.S., at Aarslev Experiment Station in 1942.

Botrytis cinerea occurred in the damp summer of 1942 on flax affected by grey speck [manganese deficiency] and lodging.

The mycelium and sclerotia of a fungus developing in cultures of flax seed were strikingly similar to those of *Sclerotinia libertiana* [*S. sclerotiorum*]. Two inoculation experiments with the organism resulted in a reduction of germination from 100 to 21 and 85 per cent., respectively.

Alternaria tenuis, a common saprophyte on flax straw damaged by fungal infections or stored under humid conditions, reduced germination from 100 to 79 and 70 per cent., respectively, in two tests, and a species provisionally attributed to *A. solani*, found on flax plants suffering from drought, manganese deficiency, and so forth, from 100 to 33 per cent.

Cladosporium herbarum is a common occupant of flax seed and straw in Denmark.

Observations are further presented on a number of physiogenic and deficiency diseases of the crop, and a tabulated account is given of laboratory and field disinfection experiments, the latter under the direction of C. Stapel, some of whose data have already been published [ibid., xxii, p. 433]. In 1942 the incidence of infection by *Septoria linicola* [*Sphaerella linorum*] on linseed fell from 68·5 to 10·3, 9·3, and 7·1 per cent. as a result of dusting with germisan-universal at dosages (per 100 kg.) of 1,600 gm., 800 gm. plus an oil 'binder' and 1,600 gm. plus oil, respectively, the first and second treatments also raising the germination percentages from 51 to 74 and 63, respectively. In 1943 dusting with tillantin [ceresan U.T.] 1875 at 2, 8, and 16 gm. per kg. with a steam 'binder' reduced the attacks of the same pathogen on the cotyledenary leaves from 65 to 12, 3, and 1 per cent., respectively, but at the two higher dosages germinative capacity was appreciably impaired. None of the mercurial fungicides effectively controlled *Polyspora lini*.

Weber (Anna). **En ny svampesygdom paa Løvemund.** [A new fungus disease of Snapdragon.]—Reprinted from *Gartnertidende, 1943*, May, 1 p., 2 figs., 1943. [Received August, 1945.]

Downy mildew (*Peronospora antirrhini*) of cultivated snapdragon (*Antirrhinum majus*) [*R.A.M.*, xvii, p. 686] was observed for the first time in Denmark in April, 1943, on the Fakkel [Torch] variety. The fungus had long ago been found in the country on the wild *A. orontium* [loc. cit.], but the mode of its spread to the affected nursery on the outskirts of Copenhagen is unknown. Applications of Bordeaux mixture retarded the progress of the disease, but failed to arrest it entirely.

Holme Hansen (H. H.), Stapel (C.), & Steenbjerg (F.). **Undersøgelser af Lucernemarker paa Lolland-Falster.** [Investigations of Lucerne fields on Lolland-Falster.]—80 pp., 19 figs., 2 maps, Stifts-Trykkeriet, Nyköbing, Falster, 1945.

Investigations to determine the causes of the unthrifty condition of lucerne on the islands of Lolland-Falster, Denmark, have been in progress since 1938. The crop is of growing importance on the islands, where it covered an area of 4,263 ha. in 1944, representing over 3 per cent. of the total under cultivation. The following diseases were observed. Clover rot (*Sclerotinia trifoliorum*) did not in general cause appreciable damage, its attacks being mostly confined to the late winter or early spring. The fungus was frequently found passing from the much more susceptible red clover [*R.A.M.*, xxiii, p. 24] to lucerne, the two crops being commonly grown as a mixture. The exceptional prevalence of the disease in 1943 was doubtless a sequel to the abnormally mild late winter and early spring, when the mean temperatures for February, March, and April exceeded the normal range by 3° to 4°, 2°, and 2° to 3° C., respectively.

In 1941 and 1944, *Verticillium albo-atrum* developed on lucerne for the first time in Denmark, causing serious losses in the latter year, when a destructive outbreak was also reported from west Zealand. In 1943 the fungus was detected on the islands of Fünen and Möen.

Peronospora trifolii, *Pseudopeziza medicaginis*, and *Ascochyta medicaginis* were all in evidence but of no great importance.

In the autumn of 1943, *Stemphylium botryosum* [*Pleospora herbarum*] severely attacked a vigorous crop, the foliage of which was shrivelled as though by frost. In the corresponding season of 1944, the fungus again appeared in the same place and spread further over the field. The development of *P. herbarum* in the particular area under observation is attributed to the waterlogged condition of the soil, necessitating late sowing, and not to a deficiency of lime, which is supposed to favour the pathogen in other countries, the P_H ranging from 7·8 to 8·1.

The occurrence of the rare wart disease (*Urophlyctis alfalfae*) in three- and four-year-old fields in 1941 is difficult to explain, since the condition of the soil did not meet the excessive moisture demands of the organism.

Hardison (J. R.). **Specialization in Erysiphe graminis for pathogenicity on wild and cultivated grasses outside the tribe Hordeae.**—*Phytopathology*, xxxv, 6, pp. 394–405, 1945.

Following up his studies at the Kentucky Agricultural Experiment Station on specialization in *Erysiphe graminis* on grasses of the tribe Hordeae and genus *Poa* [*R.A.M.*, xxiv, p. 233], the author tested the reactions of 123 species and eight varieties in 28 genera to eight cultures of the fungus from grasses outside that tribe, namely, two from *Avena* and one each from *Agrostis*, *Bromus*, *Dactylis*, *Festuca*, *Koeleria*, and *Polypogon*.

The detailed results, which are tabulated, show that seven of the cultures infect grass species outside the genus from which they were collected, while that from *K. cristata* infected only that species. Two cultures from *A. sativa* differed in pathogenicity and demonstrated specialization in *E. graminis* from *Avena*. Many grasses are susceptible to two or more widely different races and may perhaps permit hybridization between the races. Some races may conveniently bear varietal names if their specialization continues to be restricted, whereas several others have wide host ranges and a varietal designation for these appears to be impracticable. Ample opportunity for selection for mildew resistance is afforded by variation in reaction of collections of most grass species and between individual plants in many collections.

It is evident from these results that *E. graminis* on a particular grass species can no longer be assumed to be a specialized variety restricted in pathogenicity to species of the source genus. On the contrary, the tests have shown that it may be any one of a number of races or a mixture of these. The behaviour of cultures 8 and 23 from *Polypogon* and *Agrostis*, respectively, is specially suggestive of the existence of a complex group of mildew races with overlapping host ranges affecting grasses, notably certain genera of the Agrostideae. This information as to the general lack of restriction of the mildew races to any given genus permits recognition of the possibilities of interracial hybridization and of the potential sources of inoculum in the initiation of mildew infections, besides accounting for certain phases of the etiology and epiphytology of the disease.

Jørstad (I.). **Melding om plantesykdommer i land- og hagebruket. Sammenligning av sprøytemidler mot soppsykdommer på frukttrær.** [Report on plant diseases in agriculture and horticulture. Comparison of spray preparations against fungous diseases of fruit trees.]—38 pp., Oslo, Grøndahl & Søns Boktrykkeri, 1940. [Received September, 1945.]

The following are the main conclusions drawn from the results of spraying

experiments for the control of fruit diseases in Norway from 1937 to 1939 [cf. *R.A.M.*, xvii, p. 467]. Lime-sulphur was not surpassed in efficacy by any of the other sulphur-containing preparations tested against apple scab [*Venturia inaequalis*]. Of the non-sulphur fungicides tested, pomarsol [ibid., xxiv, p. 424] almost equalled lime-sulphur in efficacy. Lime-sulphur, sulphinox, and Acme lime-sulphur dust caused scorching of Åkero fruits, which were not injured, on the other hand, by pomarsol, sulfomaag, or Bayer sulphur dust.

Excellent control of apple mildew [*Podosphaera leucotricha*] was afforded by various brands of lime-sulphur and good protection by polysulphide in one year's trials.

Schneider (H.), Bodine (E. W.), & Thomas (H. E.). **Armillaria root rot in the Santa Clara valley of California.**—*Plant Dis. Reptr*, xxix, 19, pp. 495–499, 1945. [Mimeographed.]

Root rot (*Armillaria mellea*) is probably the most serious disease of stone fruits in California. Of 65 properties surveyed in the Santa Clara valley 34 had one or more infested areas, the incidence varying from one tree space to almost the whole of a property. A widely used method of control is to plant local fruit and nut crops on highly resistant stocks. Thus, walnuts are frequently planted on highly resistant California black walnut rootstock, prunes and apricots on resistant myrobalan [*Prunus divaricata*] 29 stock and pears on French pear stock, which is very hardy. Planting walnuts in spaces in fruit orchards is discouraged as necessitating two kinds of cultural and spray practices within the same orchard. The tops of walnut trees on the black walnut stock were frequently observed to be dying on reaching bearing age (black-line disease), and one case was reported of black walnut stock being killed by the oak-root fungus. Ten-year-old live prune trees on myrobalan stock were observed on infested ground in one orchard.

Jørstad (I.). **What is the correct botanical name of the Apple scab fungus?**—*Nyt. Mag. Naturv.*, lxxxiv, pp. 251–253, 1943. [Received September, 1945.]

Sydow has shown (*Ann. mycol., Berl.*, xxi, [p. 171], 1923) that the apple scab fungus, commonly known as *Venturia inaequalis* (Cke) Aderh., or more correctly as *V. inaequalis* (Cke) Wint. (emend. Aderh.) [*R.A.M.*, xv, p. 467], does not properly belong to the genus *Venturia*. He accordingly transferred it to his new genus *Endostigme* as *E. inaequalis* (Cke) Syd. Petrak (*Ann. mycol., Berl.*, xxxviii, p. 193, 1940) maintains that *Endostigme* is inseparable from Sydow's contemporary genus *Spilosticta* and re-names the pathogen *S. inaequalis* (Cke) Petr. In the author's view, however, *Endostigme* does differ from *Spilostica* in the possession of *Fusicladium* and *Pollaccia* conidial states and is entitled to retention as a distinct genus. '*Sphaerella cinerascens* Fleisch.' is, in the author's opinion, the oldest valid name for the perfect state of the scab fungus on *Pyrus aria*, *S. inaequalis* Cke being a synonym. Later homonyms are *Sphaerella cinerascens* [(Fuckel)] Fuckel and *S. cinerascens* (Schw.) Cke. As shown by Herbst *et al.* [*R.A.M.*, xvi, p. 618] and corroborated by the writer's observations in Norway, the scab fungi on *Sorbus* spp. (except *S.* [*P.*] *aucuparia*) and *Malus* [*P.*] spp. must be considered identical, the botanical name of the ascus state being *E. cinerascens* (Fleisch.) Jørst. [n. comb.] and that of the conidial *Fusicladium pomi* (Fr.) Lind., since *Spilocaea pomi* Fr. is the first legitimately published name.

Björling (K.). **En för Sverige ny Äpplesjukdom.** [An Apple disease new to Sweden.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 3, pp. 45–48, 6 figs., 1945.

From withered apple spurs in one locality of Sweden and from black-spotted fruits in another the author isolated a fungus producing two colony types in pure

culture, one grey (perithecial) and the other blackish-green (conidial), of which the former corresponded to *Pleospora mali* [? *P. herbarum*] and the latter to *Stemphylium congestum* as described by Newton from the United States [*R.A.M.*, vii, p. 789]. Since the dark-coloured colonies freely changed to the grey, either suddenly or gradually, the two types are presumed to be merely different stages in the life-cycle of a single fungus. Inoculation experiments gave positive results only on wounded fruits and spurs. Bramley, Sweet McIntosh, and Lane's Prince Albert were more susceptible than Newton Pippin and Schur, developing black, necrotic lesions 2 cm. in diameter in 20 days at 20° C.

Erikson (E.). **Certain aspects of resistance of Plum trees to bacterial canker. Part II. On the nature of the bacterial invasion of Prunus spp. by Pseudomonas mors-prunorum Wormald.**—*Ann. appl. Biol.*, xxxii, 2, pp. 112–117, 1945.

Artificial inoculations in winter with *Pseudomonas mors-prunorum* of resistant and susceptible varieties of three-year-old plum trees resulted in intercellular penetration of the tissues by the pathogen, causing plasmolysis of the cell contents, followed by disintegration of the cell walls, and gradual invasion by the bacteria, the maximum cankers caused thereby appearing in the spring [see next abstract]. Limitation of necrosis in summer is usually accompanied by the production of new tissue composed of xylem elements. Viable bacteria were isolated in the autumn from cankers in which the area of necrosis had penetrated beyond the limiting periderm. Lesions resulting in spring and summer from winter inoculations of resistant trees are generally very small, confined to the phloem, and effectively isolated by periderm. Discoloured streaks outside the periderm differ from those observed in susceptible trees in their comparative paucity and smallness in extent, and this reaction as well as the infrequence of browning in the xylem either indicates that the pathogen in the resistant tree fails to produce in comparable quantities metabolites deleterious to the host tissue or that the resistant host is not affected by such metabolites. The apparently more efficient host mechanism of periderm production in the resistant varieties is considered significant. Gum production is much more frequent in resistant trees but at most plays only a mechanical part in blocking invasion.

No difficulty was experienced in re-isolating the organism from either host between December and June; in July the bacteria were much rarer and isolations thereafter from the resistant trees unsuccessful. A few bacteria are thought to survive in the deeper-seated tissues of susceptible trees and may serve as foci of fresh infections in the autumn. This dying of the bacteria would appear to be due to physical factors or to a toxic accumulation of degeneration products.

The injection of cell-free filtrates of cultures of *P. mors-prunorum* caused lesions less extensive than those from inoculations with bacteria, but similar in histological aspect.

Erikson (D.) & Montgomery (H. B. S.). **Certain aspects of resistance of Plum trees to bacterial canker. Part III. The action of cell-free filtrates of Pseudomonas mors-prunorum (Wormald) and related phyto-pathogenic bacteria on Plum trees.**—*Ann. appl. Biol.*, xxxii, 2, pp. 117–123, 2 figs., 1945.

The authors describe experiments designed to show whether the destruction of host cells before their penetration by *Pseudomonas mors-prunorum* [see preceding abstract] is due to the production of a toxin by the organism. Four injections of cell-free filtrates, each containing 2 to 3 c.c. liquid, were made under the underlayers of the bark and the outer layers of the wood into each of 80 three-year-old plum trees, by running a needle tangentially under the bark, and inserting the bent, finely drawn end of a small glass tube into the puncture. A more satisfactory method was found when a cotton wick, leading from a tube of solution, was

threaded into a needle and thus drawn into the bark. These filtrates caused injury similar to that produced by the organism itself, and the susceptible variety suffered more than the resistant trees, injury to which was negligible, the reactions of both being identical with their reactions towards the organism. As toxic filtrates were produced from cultures on bark extracts from both varieties as well as on synthetic media, it seemed that resistance lay in reaction of the host to the toxin rather than in a limitation in the production of toxin due to the presence of an inhibiting substance or substances or the lack of some essential constituent for the growth and parasitic development of the organism. The development of this toxin was considered to be specific to organisms closely related to *P. mors-prunorum*, since comparable cultures of other parasitic and saprophytic organisms failed to yield toxic filtrates. As toxic filtrates were not obtained from young, vigorously growing cultures, but only from aged media, a search was made for an endotoxin that might be liberated by the autolysis of the organism, and in this way a toxin of protein nature was obtained from the dried bacterial cells by acetic acid extraction [cf. *R.A.M.*, xv, p. 206]. No accurate knowledge of the antigenic constitution of *P. mors-prunorum* is yet available, and thus the serological properties cannot be correlated with pathogenicity or variations in virulence.

Boehm (B.). **Apricot gummosis. Its spread in the Barossa district.**—*Aust. Dried Fruits News*, xxi, 5, pp. 14–15, 1945.

Before 1920 apricot gummosis was of rare occurrence in South Australia [*R.A.M.*, xviii, p. 121], about 1932 some 10 per cent. of the trees were involved, and since 1940 the disease is stated to have spread at an alarming rate. The various theories that have been advanced to explain the etiology of the disease are summarized.

English (H.). **Fungi isolated from mouldy Sweet Cherries in the Pacific Northwest.** —*Plant. Dis. Reptr.* xxix, 21, pp. 559–566, 1945. [Mimeographed.]

Pullularia was found to be widespread in the Pacific Northwest and to occur twice as frequently as *Alternaria mali* (with one or more other *A.* spp.). *Cladosporium herbarum* and *Botrytis cinerea* are third and fourth, respectively, in frequency of occurrence and widely distributed on sweet cherries throughout the area. *Penicillium expansum* and other spp. were found wherever mature fruit was examined. *Sclerotinia fructicola* was found only once, *S. laxa* being more prevalent. *Rhizopus* rot makes rare but costly appearances, causing great loss in shipments of sweet cherries; *R. nigricans* [*R. stolonifer*], the fungus presumably responsible, thrives at high temperatures and is likely to prove epiphytotic on fruit consigned without proper refrigeration. A species of *Lambertella* resembling *L. jasmini* was isolated from a decaying sweet cherry from Oregon.

The most serious mode of fungal infection of cherries is through the cracking of maturing fruit as a result of the absorption of water during rainy weather. In 1942, for example, this accounted for two-thirds of the decay recorded, and nearly every year rain is responsible for injury sufficient to impair seriously the keeping quality of at least part of the fruit.

Several culturally distinct forms of *Pullularia* [*R.A.M.*, xxi, p. 532] have been isolated, but their specific identity remains to be determined; their pathogenicity is weak, and is greatly influenced by fruit maturity. Inoculations with spore suspensions do not suggest their capacity to invade uninjured cherries. The rots caused are usually small, rather depressed, brown, and under conditions of high relative humidity, such as are encountered in cold storage, the surface of the lesions tends to become sticky and the skin soft. *Pullularia* abounds in this sticky matrix and in the partly disintegrated host tissue. Minute, subepidermal stromata, which eventually become erumpent, are sometimes seen, giving the lesions a rather pebbled appearance. The fungus forms no aerial mycelium and does not

spread from one fruit to another by contact. The decayed tissue does not become watery and exude from packages as frequently occurs with *Rhizopus* rot and sometimes with blue-mould decay.

All *S. fructicola* and *S. laxa* infection originated from contact with completely rotted and presumably unfertilized cherries which had failed to drop at the usual time.

JØRSTAD (I.). **Melding om plantesykdommer i land- og hagebruket. Sykdommer på baervekster.** [Report on plant diseases in agriculture and horticulture. Diseases of small fruits.]—34 pp., Oslo, Grøndahl & Søns Boktrykkeri, 1942. [Received September, 1945.]

The last survey of the diseases affecting cultivated small fruits in Norway was included in the author's report on economic horticultural plants, published in 1928 [*R.A.M.*, vii, p. 700], and the following observations relate to the period between that year and 1941. Red currant rust (*Puccinia ribis*) [ibid., xvii, p. 704] extended its range in 1941 to Tromsö (68° 42′ N.), the most northerly point from which it has yet been recorded. Although it is long since Weymouth [white] pines (*Pinus strobus*) have been planted to any extent in Norway, blister rust (*Cronartium ribicola*) is still prevalent on black currants and was also reported on the White Dutch Grape variety from four localities [ibid., xv, p. 618]. The importation of white pine plants into the country is prohibited by an order of the Department of Agriculture of 31st January, 1941, and a further Departmental circular of 24th October of the same year authorizes horticultural functionaries to destroy infected specimens. Baldwin black currants were severely attacked by gooseberry mildew (*Sphaerotheca mors-uvae*), which was also detected on gooseberries in two new northerly districts, bringing its northernmost limit to 65° 19′ N. Black currant leaves are more apt to bear the perithecia of the fungus than those of gooseberry. This mildew was further observed on Prince Albert and Victoria red currants, *Ribes bracteosum*, and *R. alpinum*. Alkaline Burgundy mixture was the best of the fungicides tested against the disease in a series of trials from 1922 to 1929 [ibid., viii, p. 731]. Among the other parasitic and physiogenic diseases of gooseberries and currants included in the report may be mentioned the currant reversion virus [ibid., vii, p. 700], the incidence of which on black currants seems to be declining in the west, where the host is less extensively cultivated than formerly owing to poor conditions for the setting of the berries. Marginal leaf scorch caused heavy damage on red currants as far north as Namdal, and in 1940 it was reported on gooseberries from Fana. In most cases the trouble is curable by soil amendments with potassium sulphate at a dosage of 50 gm. per bush.

P. Stedje, in a report of the State Fruit Production Experiment Station, Njøs (Leikanger), 1932, ranks the raspberries comprised in a six-year study on varietal reaction to *Didymella applanata* in the following order of decreasing susceptibility: Hornet, Superlative, Pyne's Royal, Lloyd George, Paragon, Herbert, and Victoria; virtual freedom from the disease was shown by Asker, Devon, Fajstrup, Empress Dagmar, Marlboro, Park Lane, Profusion, and Red Cross. From the published observations of other workers, varietal reaction to spur blight appears to vary considerably, even within the Scandinavian countries, but the resistance at any rate of Fajstrup and Empress Dagmar may be considered well established. The raspberry yellow mosaic virus has long been present in Norway, where it is one of the factors in the sharp decline in the cultivation of the susceptible Marlboro. A number of reports of the disease were submitted during the years covered by the present review, many of them relating to the Asker variety.

Hitherto only the conidial state (*Oidium fragariae*) of strawberry mildew (*S. macularis*) [*S. humuli*] has been observed in Norway, where early varieties, notably Deutsch Evern, are the most susceptible, another important factor favouring

the disease being light, warm soil. Wild strawberries have only once been found infected, in 1935. Good control was effected in 1930 and 1931 by dusting with finely ground sulphur or spraying with Høvdes mildew wash [ibid., xvii, p. 468] at 1·5 to 2 per cent. just before flowering. In spraying experiments in 1939 against leaf spots, primarily *Mycosphaerella fragariae*, two applications of 1 per cent. Bordeaux mixture between leafing and flowering increased the quantity of saleable fruit in one field from 36·4 to 82·8 hg.

Swartwout (H.). **Raspberry anthracnose.**—*Hoosier Hort.*, xxvii, 6, pp. 87–88, 1945.

Writing in *Horticultural News* (Missouri State Horticultural Society), February, 1945, the author reports good control of raspberry anthracnose [*Elsinoe veneta*] in 1944 by one delayed-dormant application of an eradicant spray consisting of 8 lb. each copper sulphate and hydrated lime, 4 lb. zinc arsenite, 6 lb. copper arsenate, 1 gal. elgetol, and 2 qts. fish oil per 100 gals., which reduced the average number of lesions per cane from 139·6 to 9·6 compared with 48·1 for the standard two-spray lime sulphur schedule. Almost equally satisfactory results were given by two treatments with fermate (2 lb. in 100 gals. plus 2 qts. dendrol at the delayed-dormant stage and 1½-100 when the new shoots were 6 to 8 in. high), the number of anthracnose lesions per cane in this series being 11·3.

Zundel (G. L.). **'Brown berry' or mild streak on Raspberry in Pennsylvania.**—*Plant Dis. Reptr.* xxix, pp. 567–568, 1945. [Mimeographed.]

The author and J. B. Demaree have reached the conclusion that 'brown berry' disease of raspberry [*R.A.M.*, xx, p. 312] is a symptom of what has been known as mild streak [ibid., xx, p. 26], which name they consider inappropriate and regard 'brown berry' or 'seedy' disease as more suitable. The disease has no stunting effect on young canes, the leaves of which, however, are hooked downward at the tips, with narrow, short, water-soaked or light grey streaks on the stem. These conditions become more pronounced with age, notably on the Morrison and Logan, and they are also found on the new Pennsylvania and Early Butler varieties. The fruit is seedy-looking and brown and the plants producing berries have a more or less yellowish appearance.

Gherson (L.). **A disease of Fragaria caused by Fusarium orthoceras.**—*Palest. J. Bot.*, J. Ser., iii, 1, pp. 54–55, 1943. [Received August, 1945.]

In 1941 strawberry plants in a Jerusalem garden withered after rooting normally, and from white spots on the dried roots *Fusarium orthoceras* was isolated. Inoculation of the soil with suspensions of the isolate or of the roots through wounds induced the characteristic symptoms, and the plants died in 70 days, the fungus being successfully re-isolated. In culture it exhibited great morphological variability. The optimum temperature for growth was 24° C., at 4° growth was checked, and a temperature of 37° was lethal. The mycelium altered its colour according to the hydrogen ion concentration of the medium, being ruby to yellow in acid media and dark blue-grey in basic.

Wilcox (R. B.) & Bergman (H. F.). **Control of Cranberry fruit rots by spraying.**—*Circ. U.S. Dep. Agric.* 723, 6 pp., 1 fig., 1945.

In a test carried out in Massachusetts in 1944, the cranberry fruit rots caused by *Glomerella cingulata* var. *vaccinii* [*R.A.M.*, xix, p. 25], *Diaporthe vaccinii* [loc. cit.], and *Godronia cassandrae* [ibid., xv, p. 817] were again controlled as well by Bordeaux mixture (10–4–100) with a suitable spreader as by the same preparation at a concentration of 10–10–100. Early spraying, when nearly all the flowers were in the late-bud stage, gave better control than was obtained when this application

was omitted. Fermate applied at the rate of 2 lb. per 100 gals. water gave as good control as Bordeaux mixture (10–4–100) applied before the flower buds opened; under conditions of light infection, omission of the early application of fermate (late-bud) did not result in increased infection.

In New Jersey, where decay often occurs in the field before picking and is generally due to early rot (*Guignardia vaccinii*) [ibid., xxiii, p. 395] and blotch rot (*Acanthorhynchus vaccinii*) [loc. cit.], a test was carried out in 1943, in which fermate (3 lb. per 100 gals.), applied five times during the season, was compared with Bordeaux mixture (8–8–100). At harvest, the incidence of rot was only 5 per cent. for fermate, as against 58 per cent. for Bordeaux mixture and 90 per cent. for the untreated controls.

More extensive tests were made in 1944, using three and five applications of fermate (1, 2, and 3 lb. per 100 gals. and as a 10 per cent. dust diluted with talc) and of Bordeaux mixture (8–8–100 and 8–4–100). Two months after harvest the untreated controls showed 92 per cent. rot, the Bordeaux treatments 63 to 59 per cent., and the fermate treatments 39 to only 17 per cent., depending on the concentration of the fermate. The amount of fermate in lb. per acre applied as dust was equivalent to the amount applied as spray at 3 lb. per 100 gals., but the rot control that resulted was equivalent only to that given by the spray at 1 lb. per 100 gals. Fermate sprays were also tested on a commercial scale (up to 30 acres) in comparison with Bordeaux mixture by several New Jersey growers in 1944. In every case except one, where very little rot developed, the results were in favour of fermate.

On the basis of these results it is recommended that cranberries should be sprayed against fruit rots with either fermate or Bordeaux mixture (*a*) during the late-bud stage, but before appreciable flowering, (*b*) at the end of the flowering period, and (*c*) two weeks later. When fruit decay has been very serious two further applications may be made at intervals of about two weeks. On bogs where fruit rots have been serious, fermate (3 lb. per 100 gals.) will probably give better control than Bordeaux mixture of any strength. Bordeaux mixture (8–4–100) will, however, considerably reduce infection, and where little rot is present may be as effective as fermate. With fermate no spreader is necessary, but with Bordeaux mixture 1 lb. calcium caseinate or 1 lb. resin fish-oil soap is advised.

Whetzel (H. H.) & Wolf (F. A.). **The cup fungus, Ciboria carunculoides, pathogenic to Mulberry fruits.**—*Mycologia*, xxxvii, 4, pp. 476–491, 4 figs., 1945.

The cup fungus, originally known as *Sclerotinia carunculoides* [*R.A.M.*, i, p. 387; iii, p. 48], pathogenic to the white mulberry (*Morus alba*) throughout the south-eastern United States, and responsible for popcorn disease, is transferred, as a result of the researches presented in the present paper, to *Ciboria* and designated as *C. carunculoides* (Siegler & Jenkins) Whetzel. The fungus possesses sclerotial and apothecial phases, but no conidia; the ascospores are forcibly expelled, lodge on the stigmas, and initiate infection at the time of flowering. Each drupelet of the aggregate fruit may thus become a separate sclerotium. These sclerotia resemble popcorn grains and are responsible for the popular name of the disease. Apothecia for the succeeding year develop in the spring about a month after ascospore discharge and originate from elements of a mantle, consisting of spermatiophores, which develops immediately beneath the outer tissues normally destined to become the fleshy portion of the mulberry fruits, and completely invests the young sclerotium.

The spermatia are produced in abundance and are extruded in a column at the tip of each sclerotium. The sclerotia fall to the ground during midsummer, become black, and remain dormant until the following spring, when each bears one or two perithecia. An increase in the size of the sclerotia, due to the presence of a

gelatinous covering on the sclerotial hyphae, is a sign that the pathogen is awaking from hibernation. The ascospores have similar envelopes, causing them to adhere, and yielding moisture for germination.

The apothecia, 1 to several from a sclerotium, have a cupulate to subcupulate disk, 4 to 12 mm. diameter, snuff-brown within, Prout's brown without; and a cylindrical, flexuous stipe, 15 to 42 mm. long by 1·5 mm. in diameter. The asci are cylindrical to cylindro-clavate, 104 to 123 by 6·4 to 8 μ. The reniform ascospores, 6·4 to 9·6 by 2·4 to 4 μ, have a caruncle on the concave surface. Filiform to cylindro-clavate paraphyses are present. The hyaline, ovate spermatia measure 3·6 by 2·4 μ.

S. shiraiana, parasitic on mulberry in Asia, belongs to the same genus and is renamed *C. shiraiana* (Henn.) Whetzel.

Reid (W. D.) & Brien (R. M.). **Control of grease-spot of Passion-Vine.**—*N.Z. J. Sci. Tech.*, A, xxvii, 1, pp. 1–3, 1 fig., 1945.

On the basis of experiments conducted in 1942-3 and 1943-4, the following recommendations are made for grease spot (*Phytomonas passiflorae*) control in passion vines in New Zealand [*R.A.M.*, xviii, p. 331]. The vines should be pruned after harvesting to facilitate spraying, which should then be carried out immediately with 3-4-50 Bordeaux mixture. Between mid-March and mid-August at least four treatments at the same strength will be required monthly. In the first season's tests, the final incidence of fruit infection was reduced from 66·2 to 1 per cent. by six applications of Bordeaux mixture, while in those of the second year the final percentages of fruit disease for one, two, three, and four treatments were 1·2, 1·2, 0·3, and 0·2, respectively, compared with 10·3 in the unsprayed rows.

Arnaud (G.). **Essais de traitement des maladies des plantes en 1941.** [Experimental treatments of plant diseases in 1941.]—*Ann. Épiphyt.*, N.S., viii, pp. 99–109, 1942. [Received September, 1945.]

The results of spraying tests carried out in 1941 in south-western France for the control of vine downy mildew [*Plasmopara viticola*] confirmed the view that as the copper sulphate content of copper mixtures is reduced below 2 per cent., so their effectiveness becomes progressively diminished. Even at 2 per cent. concentration, Bordeaux mixture fails to give complete control in some vineyards. If it is essential to economize in copper, it is best to make at least five or six applications, using about 6 hectol. mixture per ha. At a 2 per cent. concentration, this represents about 60 to 72 kg. copper sulphate per ha.

In tests against vine powdery mildew (*Uncinula necator*), three applications of sublimated sulphur gave almost perfect control.

In preliminary trials against wheat bunt [*Tilletia caries* and *T. foetida*] by Mlle Gaudineau, complete control was given in autumn sowings by seed treatments with cupric chloride dust (2 gm. per kg.), cupric powder C (with a copper oxide base), milk of copper K (used dry), and tetrabasic copper sulphate, as against an average infection of 22·55 per cent. in the untreated controls. With spring-sown seed, Bordeaux mixture (2 per cent.) permitted 0·21 per cent. infection, salicylic acid (suspension at 2 per 1,000) 0·23, formalin (2·5 per 1,000) 0·4, copper carbonate 0·5, cupric mixture (1 per cent. copper sulphate) with trisodic phosphate 0·6, and organo-mercuric product C 0·66, as against 18·9 per cent. in the untreated controls.

Darpoux (H.). **Les bases scientifiques des avertissements agricoles.** [The scientific bases of agricultural spray warnings.]—*Ann. Épiphyt.*, N.S., ix, pp. 177–205, 3 figs., 2 diags., 10 graphs, 1943. [Received September, 1945.]

After pointing out that owing to the present shortage of fungicidal materials

spray warnings are of even greater importance than has been the case hitherto, and referring to the fact that in 1938 they allowed the number of treatments against vine mildew (*Plasmopara viticola*) applied in central France to be reduced to one, as against four or five in most years, the author states that the methods used are based on a knowledge of the biology of the parasite, of the action of environmental factors on its development, and of the susceptibility of the host in its different stages. This knowledge is built up by the agricultural research stations and is made use of by the spray-warning stations, which have also to take into account (*a*) meteorological factors (by daily observations and the forecasting, when possible, of certain of these factors), (*b*) the ratio of untreated to treated surface-area, and (*c*) statistical data concerning epidemics in earlier years. The author next deals in detail with each of these points in relation to vine mildew, potato blight (*Phytophthora infestans*), apple and pear scab (*Venturia inaequalis* and *V. pirina*, respectively), and certain insect infestations.

He concludes that the methods at present in vogue leave too much to empiricism and to the personal experience of those responsible for issuing the spray warnings. It would seem desirable to undertake an investigation of all the different methods of transmission or propagation of every disease against which spray warnings are or could be issued. A methodical, scientific study should be made of the effect of environmental factors on the biology of the organisms concerned, and the results reduced to laws and expressed graphically. Work should also be carried out on host susceptibility, and the critical stages of such susceptibility exactly determined. Finally, phenological data must be acquired and a relationship established between the development of a given disease and that of other parasites or higher plants. For example, in Bordeaux, several workers have noted that the first attack of *Gnomonia veneta* on plane trees precedes by a few days the first attack of *Plasmopara viticola* on vines. It appears that *G. veneta* reacts more quickly than *P. viticola* to climatic factors, and its presence may therefore serve to forecast the first invasion of vine mildew.

A bibliography of 40 titles is appended.

Brown (W.). **Plant pathology ; teaching and research.**—*Ann. appl. Biol.*, xxxii, 2, pp. 89–96, 1945.

In his presidential address to the Association of Applied Biologists the author suggested a sound physical and mathematical background as a preliminary to undertaking biological studies. Meagre instruction in these basic sciences forms the chief objection to agricultural colleges as training-grounds for plant pathologists and, although the universities offer advanced courses on scientific subjects related to plant study, their urban location divorces students from intimate contact with growing plants. Good laboratory equipment and facilities for field study were essential and direct attack on field problems, with theoretical research harnessed in support, was the best practical way of keeping the vexed question of academic and applied research in proper perspective. Successful research meant increased plant production, lower prices and rising standards of living, or less land to grow the produce required—an important consideration for the national economy of so small a country as Great Britain. Such work should, therefore, be a national charge. Nevertheless, the organization of plant-pathological research left much to be desired. It was still no one's particular function to collate the work done on a particular problem and to devise steps for solving it; and there are many growers' problems to which no clear answer can be given, because the necessary research work has not been done. If, therefore, as seems likely, there is to be a continued intensification of agriculture in this country, the first requirement is a well-directed concentration on the problems which the practical grower puts before the scientific worker.

LAL (B. N.). **Plant-injection methods for the diagnosis of mineral deficiencies in Tobacco and Soya Bean.**—*Ann. Bot., Lond.*, N.S., ix, 35, pp. 284–295, 9 pl., 8 figs., 1945.

The author describes the injection methods most suitable for diagnosing mineral deficiencies in tobacco and soy-bean plants. Dye solutions were used for determining the best methods of injection and these methods were then used for injecting solutions containing compounds of nitrogen, phosphorus, potassium, magnesium, or iron into tobacco and soy-bean plants grown in sand and supplied with all essential elements except the one injected. The leaf-stalk method was most suitable for the former and the interveinal for the latter.

WALLACE (R. H.) & BUSHNELL (R. J.). **A simple and effective humidity control.**—*Plant Physiol.*, xx, 3, pp. 443–447, 2 figs., 1945.

The authors describe in detail an apparatus for regulating humidity in a chamber to within 1 per cent. An interesting feature of the apparatus is the humidistat, consisting of a bag of cellulose acetate, the expansion and contraction of which, with the rise and fall of humidity, respectively, moves a mercury switch controlling a current that activates the grid of a radio valve. This in turn starts or stops a motor feeding water to an evaporator.

Microanalysis of food and drug products.—171 pp., 67 figs., 37 diags., Washington, Federal Security Agency, Food and Drug Administration, 1944.

This circular (No. 1 of the above-mentioned organization) comprises sections on the detection and identification of moulds in citrus fruits, dairy products, dried chilli peppers, berry and stone fruits, and tomato products.

CHUPP (C.), STEVENS (N. E.), & MCCUBBIN (W. A.). **The value of plant quarantine disease surveys in extension, research and quarantine programs.**—*Plant Dis. Reptr, Suppl.* 152, 16 pp., 3 maps, 1945. [Mimeographed.]

The first author, discussing 'ways in which the emergency plant-disease prevention program aids extension' advocates that the plant disease surveyor should concentrate on distinct projects, obtaining data required by the extension specialist or the investigator, and not merely report diseases indiscriminately. The second author discusses 'research and plant disease surveys', and in particular the importance of disease forecasting. The third contribution concerns the 'relations of plant disease survey to quarantine and regulatory activities'.

AINSWORTH (G. C.) & BISBY (G. R.). **A dictionary of the fungi.** Second Edition. viii+431 pp., 138 figs., Imperial Mycological Institute, Kew, Surrey, 1945. 20*s.* or $4.60.

The chief changes and additions in the second edition of this dictionary [*R.A.M.*, xxiii, p. 140] are the listing of new genera from Supplements 1–10 (1940–44) of this *Review*, a new arrangement of the Phycomycetes in the light of Sparrow's work [ibid., xxii, p. 327], a systematic arrangement of the genera, and short biographical notes on an additional fifty important mycologists. Professor G. W. Martin has made changes in his key of the Families of Fungi and many minor alterations have been made throughout the text.

The mouldproofing of leather. Discussion by leather chemists.—*Leath. World*, xxxvii, 25, p. 432, 1945.

In the course of a paper on the mould-proofing of leather [*R.A.M.*, xxiv, pp. 331, 332] read by Miss Dempsey at a recent meeting of the London group of the Society

of Leather Trades Chemists, evidence was adduced for the damage of leather grain by moulds, which are probably, though not certainly, also responsible for injury to the corium fibres. In this connexion the importance of mould-proofing of leather intended for tropical service is emphasized. Vegetable-tanned material is the most liable to microbiological infection and chrome-tanned and chamois the least, while semi-chrome occupies an intermediate position. Para-nitrophenol, the most effective single fungicide for the purpose in view, should be added to the leather as late as possible in the manufacturing process. If incorporated in aqueous solution less is required than when added in the grease, at which stage 0·3 per cent. should be applied to vegetable and 0·1 per cent. to semi-chrome- or chrome-tanned. Leather articles not previously proofed should be sprayed with a 0·4 per cent. solution of para-nitrophenol or 1 per cent. beta-naphthol in 50 per cent. aqueous methylated spirits.

Mr. Atkin's work for various Service Departments had demonstrated the preservative efficiency of para-chlor-meta-cresol as an alternative to para-chlor-meta-xylenol or para-nitrophenol.

Snow (D.) & Watts (P. S.). **The effect of sulphanilamide and other bacteriostatic drugs on the growth of moulds.**—*Ann. appl. Biol.*, xxxii, 2, pp. 102–112, 4 figs., 1945.

This paper describes the testing of 50 isolates of *Aspergillus* and *Penicillium* spp. for their reaction to sulphanilamide, sulphonamide E.O.S. (a highly soluble compound containing 53 per cent. sulphanilamide, which is set free in solution), sulphapyridine, sulphamezathine, sulphaguanidine, propamidine and phenamidine. The moulds showed a high degree of specificity in their reactions. *Aspergillus* spp. proved more susceptible to the drugs than *Penicillium* spp. Concentrations of 1 in 8,000 of sulphanilamide, sulphonamide E.O.S., or propamidine inhibited most species of *A. glaucus*, but the other drugs had only slight effect on mould development. *A. versicolor* and *A. sydowi* exhibited like reactions to the drug concentrations, consistent with their morphological relationships. *Penicillium* spp. were generally unaffected by small concentrations and only partially inhibited by higher concentrations up to 1 in 125 of sulphonamide E.O.S. Propamidine was more effective against certain *Penicillium* spp., though not all were susceptible. Some of the moulds were slightly stimulated by small concentrations of the drugs.

Different strains of the same species sometimes showed different degrees of resistance or susceptibility to the drug concentrations. Two strains of *A. ruber* markedly resisted propamidine when incorporated on beer wort agar, while four other strains were susceptible when incorporated on the same medium.

Accelerated laboratory tests have established that the storage life of ground linseed cake [*R.A.M.*, xxiii, p. 397] incorporated with 0·2 per cent. sulphonamide E.O.S. can be doubled when stored at 85 and 80 per cent. relative humidity and at 25° C. Where the outside of the cakes was sprayed with a 2 per cent. solution of this drug the length of storage was increased three- to fourfold compared with untreated cakes stored at humidities between 100 and 80 per cent. Dipping of cheeses under laboratory conditions in a 2 per cent. sulphonamide E.O.S. solution before larding has more than doubled the storage life of cheeses stored at similar humidities.

Izrailsky (V. P.). **Antibiotic substances and bacteria control in animals and plants.**—*Успехи Современной Биологии* [*Advances in modern biology*], *Moscow*, xix, 3, pp. 358–371, 1945. [Russian.]

The author traces the growth of antibiotic research from Pasteur to the present day, and reviews the work of several investigators of the products of *Penicillium*

spp. and their properties, following the discovery of penicillin by Fleming in 1929. A bibliography of 76 titles, twelve by Russian authors, is appended.

THOM (C.). **Mycology presents penicillin.**—*Mycologia*, xxxvii, 4, pp. 460–475, 1945.

The author traces the mycological history of the discovery and development of penicillin up to the present time, when in the United States alone $20,000,000 is reported to be invested in industrial plants with a reputed production of 100 billions of Oxford units of penicillin per month by workers most of whom were totally unacquainted at the start with the mould problems involved.

WAKSMAN (S. A.) & SCHATZ (A.). **Strain specificity and production of antibiotic substances. VI. Strain variation and production of streptothricin by Actinomyces lavendulae.**—*Proc. nat. Acad. Sci., Wash.*, xxxi, 7, pp. 208–214, 1945.

A culture of *Actinomyces lavendulae* in the authors' laboratory was found to possess distinct antibiotic properties, and to produce streptothricin [*R.A.M.*, xxi, p. 248]. Variants differing in their capacity to produce this antibiotic substance were readily isolated from it. These variants also differed in other cultural and physiological characters, and those that did not form aerial mycelium failed to produce streptothricin.

BOSE (S. R.). **Anti-bacterial action of 'polyporin' against typhoid, cholera, dysentery, and B. coli.**—*Nature, Lond.*, clvi, 3954, p. 171, 1 fig., 1945.

Further trials with polyporin (filtrate of a *Polyporus* sp. in Czapek-Dox medium, P_H 7) were made *in vitro* in plate cultures with typhoid, cholera, and dysentery organisms, and *B[acterium] coli*, and clear lytic zones were obtained. A sodium salt of polyporin had greater potency than the crude filtrate. In broth cultures of typhoid bacillus and *Staphylococcus aureus* the sodium salt produced lytic action in about 20 hours [cf. *R.A.M.*, xxiv, p. 158]. Sporophore extracts from the dried fruit body had distinct bacteriolytic action. Animal experiments with polyporin showed that it was entirely non-toxic. It retained its potency at room temperature for about a month when kept in a sterile condition.

RAYNER (M[ABEL] C.). **Origin of toxicity to fungi in Wareham Heath soil.**—*Nature, Lond.*, clvi, 3954, p. 174, 1945.

Referring to the discovery of antibiotic activity by species of *Penicillium* in Wareham soil [*R.A.M.*, xxiv, p. 332], the author points out that her observations suggest that the distribution and abundance of the soil *Penicillium* spp. present are sporadic throughout the experimental area, and may, perhaps, be influenced by seasonal conditions. In the present state of knowledge it is an open question whether gliotoxin as such is the immediate cause of the observed phenomena in Wareham soil, or whether it is only one of various microbiological disturbances conducing to soil infertility.

Boletus bovinus was the only known mycorrhiza-former of pine [ibid., xxi, p. 299] and spruce initially present throughout the area. *B. elegans* appears in adjoining woods of larch, of which it is a mycorrhiza-former [ibid., xxi, p. 388]. *Mycelium radicis nigrostrigosum* has not been observed, unless introduced in soil inocula, though abundant as a mycorrhiza-former in woods of Scots pine adjoining the area [ibid., xxii, p. 266]. *Phoma radicis callunae* is the mycorrhiza-former of *Calluna vulgaris*, a natural dominant on Wareham heath. The differential susceptibility of these mycorrhizal fungi to gliotoxin, as recorded by Dr. Brian, agrees with all observations and facts relating to growth activity of those present in the experimental area, and accords with expectation in the case of those not present.

FRIES (N.). **Die Einwirkung von Adermin, Aneurin und Biotin auf das Wachstum einiger Ascomyceten.** [The effect of adermin, aneurin, and biotin on some Ascomycetes.]—*Symb. bot. upsaliens.*, vii, 2, 73 pp., 10 graphs, 1943. [English summary.]

This expanded, fully tabulated and documented survey of the author's studies on the response of certain Ascomycetes to the growth substances adermin (vitamin B_6), aneurin (vitamin B_1), and biotin embodies the experimental results already briefly noticed from another source [*R.A.M.*, xxii, p. 398].

FRIES (N.). **Untersuchungen über Sporenkeimung und Mycelentwicklung bodenbewohnender Hymenomyceten.** [Investigations on spore germination and mycelial development of soil-inhabiting Hymenomycetes.]—*Symb. bot. upsaliens.*, vi, 4, 81 pp., 19 figs., 1 diag., 1 graph, 1943. [English summary. Received August, 1945.]

The principal object of the investigations herein fully described and tabulated was the inducement of spore germination in Swedish soil-inhabiting species of *Tricholoma*, *Amanita*, *Paxillus*, *Boletus*, *Hydnum*, and *Craterellus* by means of activating organisms, mostly *Torulopsis sanguinea*, which proved superior for the purpose to the wild yeast 'X' [*R.A.M.*, xxii, p. 398]. The activator was incorporated in the Petri dish cultures in which the spores were grown, mostly on malt or glucose tartrate agar. Ten out of 11 species of *Tricholoma* germinated, of which six required the aid of *Torulopsis sanguinea*. Even in the most fruitful species, *Tricholoma imbricatum* and *T. pessundatum*, the germination percentage was very low, in five test species it did not exceed 1 per cent., while in *T. album* and *T. rutilans* it was under 0·1. *T. nudum* gave uniformly negative results, even in the presence of the activator. A number of the species under observation are mycorrhiza-formers [ibid., xxii, p. 104].

No germination occurred in any of the *Boletus* spp. tested without activation by *Torulopsis sanguinea*. *Coenococcum graniforme* [*C. geophilum*, loc. cit. and Wakefield and Busby, *Trans. Brit. mycol. Soc.*, xxv, p. 126, 1941] enabled *B. bovinus*, *B. luteus*, and *B. variegatus* to germinate on glucose tartrate agar plus 1 γ vitamin B_1 per plate, *Mycelium radicis atrovirens* exerted a comparable effect on *B. luteus* and a less marked one on *B. variegatus*, while *Pythium aphanidermatum* also stimulated germination in the last-named species only. *B. luteus* and *B. variegatus* likewise responded favourably to the addition to glucose tartrate agar of fruit body extracts of *A. muscaria*, *B. variegatus*, *Hygrophorus erubescens* (*B. variegatus* only), and *Lactarius rufus*. A study of the comparative duration of viability in *Boletus* spores showed this property to be retained for the longest period (300 days and upwards) by *B. luteus* and *B. viscidus*, and for the shortest (maximum of 170) by *B. bovinus*. In general, storage at — 10° C. prolonged the period of viability.

Of the other fungi tested *A. mappa*, *Paxillus involutus*, *Hydnum repandum*, *H. imbricatum*, and *Craterellus lutescens* all required the presence of the activator for germination.

Service and regulatory announcements, January to March, 1945. Announcement relating to black stem rust quarantine (No. 38).—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 1–2, 1945.

Under this (fourth) revision of *Circ. B.E.P.Q.* 385, effective as from 24th January, 1945, *Mahonia dictyota*, *M. gracilis*, and *M. pinnata*, which have been proved to be immune from, or highly resistant to, black stem rust [of cereals: *Puccinia graminis*], are added to the list of barberries allowed to be shipped into or between the protected States under permit [*R.A.M.*, xxiv, p. 304].